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THE WORLD'S STEAM AND SAIL TONNAGE.

While the additions to the world's registered tonnage have not been as great during the past twelve months as they were during the twelve months preceding, the increase has nevertheless been more important than in any previous annual period. The following table shows how gradual and persistent has been the growth of the world's merchant navies during the last thirteen years, only those steamers measuring more than 100 tons net and sailers of over 50 tons net being reckoned:

Autumn of	Steamers, Net reg. tons.	Sailers, Reg. tons.	Total net reg. tons.
1889	7,748,000	11,081,000	18,829,000
1890	8,286,000	10,540,000	18,826,000
1891	8,872,000	10,217,000	19,089,000
1892	9,226,000	10,093,000	19,319,000
1893	9,674,000	9,829,000	19,503,000
1894	9,994,000	9,547,000	19,541,000
1895	10,360,000	9,324,000	19,684,000
1896	10,761,000	9,136,000	19,897,000
1897	11,427,000	8,894,000	20,321,000
1898	11,687,000	8,693,000	20,380,000
1899	12,165,000	8,347,000	20,512,000
1900	13,465,000	8,205,000	21,670,000
1901	14,663,000	8,119,000	22,782,000

Since last autumn, therefore, the net register tonnage of the steamers has increased by 1,198,000 tons, while the sailing tonnage only decreased by 86,000 tons. The tonnage under sail continues, therefore, to grow less, but the rate of decrease is getting smaller year by year, and it is quite possible that in the course of a year or two the tide may turn, and there may be an increase. The French shipping bounties have, no doubt, had a great deal to do with this result. Taking the various flags separately, it is Great Britain that has gained the most in steam tonnage, then follows Germany, and next the United States, while France, in spite of all the state aid, shows an extremely slight improvement in the gross, and even a decrease in the net tonnage. The order of importance in respect of steam tonnage is now the following:

	Gross.	Net.
Great Britain	12,457,000 tons	7,817,000 tons.
Germany	2,430,000 "	1,548,000 "
United States	1,369,000 "	913,000 "
France	1,079,000 "	535,000 "
Norway	779,000 "	499,000 "
Spain	736,000 "	455,000 "
Italy	671,000 "	434,000 "

The increases in the steam tonnage since last autumn are:

	Gross.	Net.
Great Britain	598,000 tons.	422,000 tons.
Germany	261,000 "	196,000 "
United States	186,000 "	105,000 "
France	19,000 " (dec.)	28,000 "
Norway	10,000 "	20,000 "
Spain	78,000 "	29,000 "
Italy	115,000 "	76,000 "

The proportion of the world's steam tonnage held by Great Britain is now 53 per cent., while in 1899 it was 58 per cent. The Japanese steam fleet, which as late as 1899 stood seventh on the list, has now sunk to the ninth place with 518,000 tons gross, and the eighth place is taken by Russia with 550,000 tons gross. Among the sailing fleets of the world, the British is less by 161,000 tons; Norway and Germany have also less sailing tonnage (15,000 tons each), while the other countries have experienced an increase, namely, the United States, 37,000 tons; Italy, 10,000 tons; Russia, 24,000 tons; France, 60,000 tons; Sweden, 14,000 tons. The order as regards sailing tonnage is as follows:

Great Britain	2,352,000 tons.	Italy	510,000 tons.
United States	1,397,000 "	Russia	502,000 "
Norway	883,000 "	France	401,000 "
Germany	536,000 "	Sweden	288,000 "

While Great Britain has been continually decreasing her sailing tonnage, she still holds nearly a third of the whole quantity afloat. Following is a table showing the total holdings (steam and sail combined) of the ten principal maritime countries expressed in register tons gross:

Great Britain	14,809,000	Italy	1,181,000
Germany	2,966,000	Russia	1,052,000
United States	2,766,000	Spain	847,000
France	1,480,000	Sweden	713,000
Norway	1,382,000	Holland	626,000

The steamship El Alba of the Morgan line, designed by Horace See, was launched last Saturday from the works of the Newport News Ship Building & Dry Dock Co., Newport News, Va. This makes the twelfth vessel launched at this yard for this line. All of them are in service except the government transport Yosemite (El Sud), which went down in the typhoon off Guam. El Alba's dimensions are: Length over all, 406 ft.; length between stem and propeller post, 380 ft. 8½ in.; breadth, 48 ft.; depth, molded, to awning deck, 33 ft. 9 in. The engines are triple-expansion with cylinders of 33, 52 and 84 in. diameter and 45 in. stroke. Steam is furnished by three double-ended boilers 13 ft. 10 in. in diameter and 20½ ft. long.

SUCCESSFUL STEAMBOAT LINE.

When Mr. T. F. Newman and others of Cleveland undertook the organization of the Cleveland & Buffalo Transit Co., a few years ago, they actually found some difficulty in disposing of the stock. Notwithstanding the success of high-class side-wheel steamboat service for passengers and freight between Cleveland and Detroit it was thought that railroad competition would be too severe for a similar line between Cleveland and Buffalo. But from the outset the Cleveland and Buffalo project was a success, and after building two of the finest side-wheelers afloat, with good terminals at both Buffalo and Cleveland, the company shows earning power that must certainly be very gratifying to the stockholders. A meeting to consider the matter of distribution of surplus, to be held Dec. 3, brings out the following statement:

Assets—	
Jan. 1, 1901	$1,353,802.57
Liabilities—	
Jan. 1, 1901, including capital stock, $750,000	1,195,041.97
Net surplus Jan. 1, 1901	$158,760.60
Net profit Jan. 1, 1901, to Oct. 1, 1901	274,443.15
Total surplus, or undivided profit, Oct. 1, 1901	$443,203.74
Less charged to surplus account interest paid on bonds	13,817.90
Net surplus, Oct. 1, 1901	$419,385.75

The directors propose that the capital stock be increased from $750,000 to $1,000,000, the increase of $250,000 to be divided among the stockholders and to be paid for out of their proportion of surplus. Of course the earnings of the company this year are due largely to Pan-American exposition traffic, but the growth of business has been of a substantial kind anyhow and the advertising given to the line through the Pan-American will tend toward a very material increase in this natural growth.

Stockholders of the White Star line of Detroit, owning the well-known steamer Tashmoo, met a few days ago and decided to increase their capital stock from $200,000 to $500,000. Present stockholders are to pay in $10 a share towards the increase of capital and it is said, without a statement being made of the company's condition, that with this arrangement no bonds need be issued for the construction of the steamer Greyhound, which is to come out in June next. It is also said that when the Greyhound is completed the company will own $735,000 worth of property, while the bonds will be only those standing against the Tashmoo, about $214,000.

PROFITABLE SEASON ON THE LAKES—ORE SHIPMENTS.

In saying that the season of lake navigation now nearing a close will prove quite profitable to vessel owners it is only necessary to note that the rate per ton on iron ore from the head of Lake Superior to Ohio ports has been advanced during the past few days to $1.25 and that grain freights are proportionately high. Of course it is understood that the great bulk of the season's business was covered last spring by contracts based on 80 cents for ore from the head of Lake Superior, and that some of the ships will therefore be barred from the advantage of the present high rates except for a few trips. It is also understood that the inability of the railroads to provide cars for ore and coal has so delayed the ships in port that their capacity throughout the season has been cut down probably one-fifth. But notwithstanding these drawbacks the freights have been high enough to insure a very fair profit all around for wooden vessels as well as the big steel craft, and the outlook for another year, in view of the large amount of business booked ahead by the steel makers and the shortage that must exist in coal shipments when the season ends, is very encouraging.

It is now more than probable that the movement of iron ore from the Lake Superior district will be something more than 20,000,000 gross tons, this including the few hundred thousand tons that is moved every year by rail. The total output in 1900, including rail shipments, was 19,059,393 gross tons, so that the gain is to be a little more than 1,000,000 tons. Reports from all the shipping docks show a total movement to Nov. 1 of 18,143,537 tons, against 17,287,925 tons on the same date a year ago. October shipments aggregated 2,986,468 tons. This is more ore than was moved in September of this year and it is 583,581 tons in excess of the October shipments a year ago.

Theodore C. Search, who is interested with other Philadelphia capitalists in the Clergue industrial enterprises at Sault Ste. Marie, says that the new steel works will begin operations by Jan. 1 with a daily output of 1,000 tons of steel of all kinds. This steel, which will be made temporarily from the company's ores smelted at Midland, Ont., will get a bounty of $3 a ton from the Dominion government in addition to a similar bounty paid on each ton of pig iron made from Canadian ore which enters into its manufacture. By next May it is expected to have the blast furnaces now under construction at the Sault ready to blow in. While the output from these works will hardly find its way into the United States, it is certain of a market in Canada. The new company aims at supplying 375,000 tons of steel required in Canada next year.

The great United States naval dock, known generally as the Algiers floating dry dock, has reached New Orleans successfully. The towing of this immense dock from Sparrows Point, Md., to New Orleans has been one of the greatest feats of towing ever performed, the dock making the marvelous speed of 8 miles per hour in spite of tempestuous weather. The navy department has given notice that the battleship Illinois will be the first vessel to be docked in the new dock.

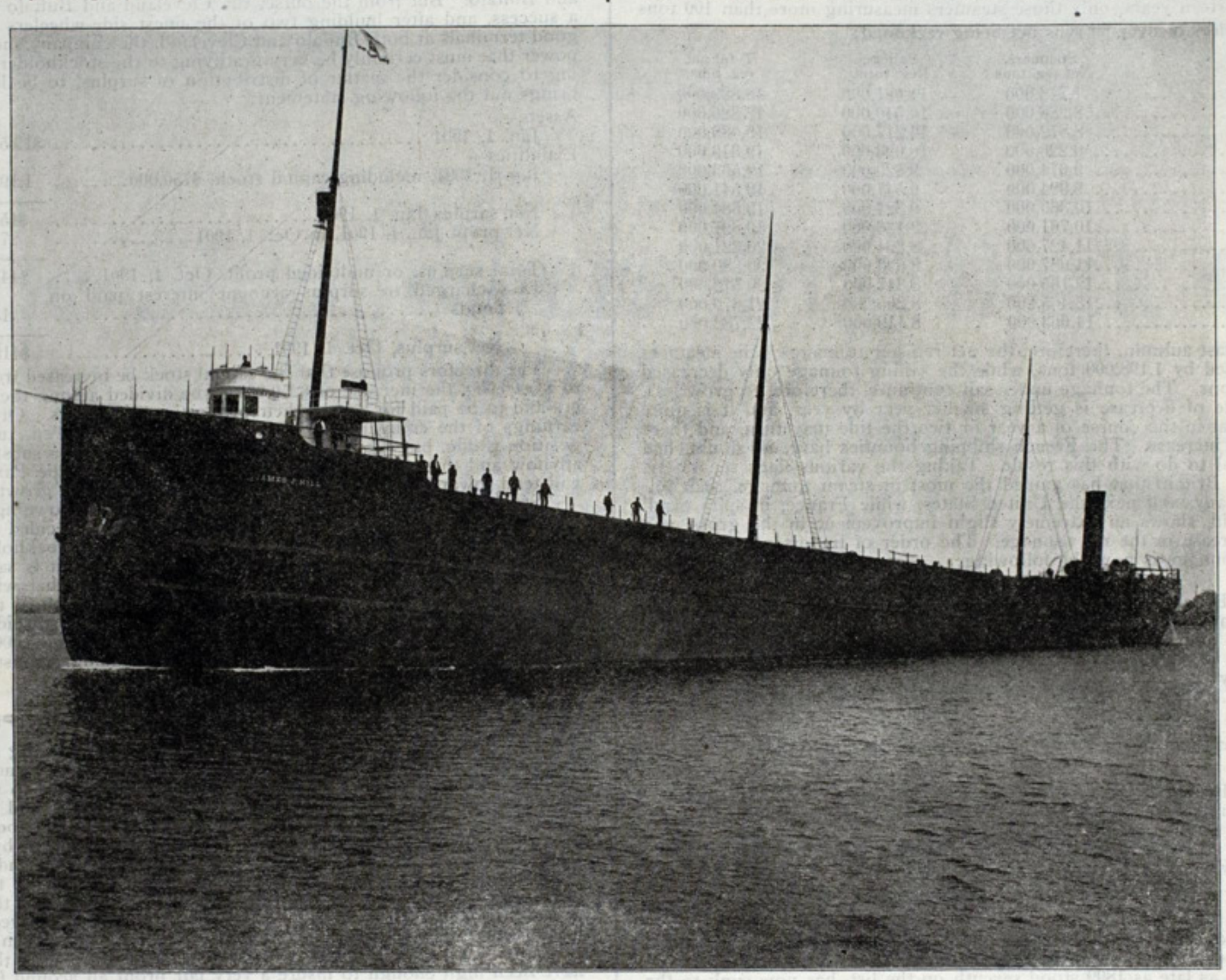
IMPROVEMENTS AT FORE RIVER COMPANY'S WORKS.

A writer in the Boston Evening Transcript says that the next few months will witness extensive changes in the works of the Fore River Ship & Engine Co. at Quincy, Mass., for before the summer rolls round again 280,000 sq. ft. of open ground, lying between the present berth of the cruiser Des Moines and the southern boundary of the grounds, will be covered by a new building which already has been planned, and a new wharf will be laid out along the water front, in another part of the yard, for a distance of 1,000 to 1,200 ft. For some time the masons have been at work preparing for the new building by laying a foundation wall along the water front, for a distance of 325 ft., and now this practically is completed. Extending from this wall to a point more than 400 ft. inland, at one section of this space, is a foundation of solid stone several feet in width which is ready to receive the keel of the new seven-masted schooner, which the company has contracted to build for a body of Boston capitalists. It was planned to lay this keel last week, but for some reason the work was delayed slightly, and the only weight which the foundation felt was that of a large number of wooden frames which are to enclose the schooner on each side. Not only will this mammoth seven-master be built within the new structure, but there will be sufficient space in the center span for the erection of the two new battleships, Rhode Island and New Jersey, which contract has been awarded the Fore River company by the government; and on the other side of them there will be plenty of room left for still another vessel, or possibly two. In keeping with the company's general policy of constructing its buildings and its ships at the same time, the latter perhaps even in advance of the former, there will be no hurry to begin the new structure, and the framework will be in place some time before it is enclosed. The distance from the ground to crane will be 100 ft. The chief feature of the new wharf and dock will be a folding jib Gantry crane. This will tower in the air 146 ft. 8 in. and its 90-ft. boom will be able to handle masts and ship's fittings almost as if they were toys. This crane will differ materially from those in common use at ship yards, for instead of remaining stationary and doing its work only after the vessel has been moved within the radius of its "arm," this huge crane can be moved to accommodate the vessel. The advantages of the improvement are obvious: with several vessels lined up along this wharf it will not be necessary to remove one at the head of the line to make room for another and so work can continue uninterruptedly.

It has been understood generally that the cruiser Des Moines would be launched about the beginning of November, but as a matter of fact she will not receive her first dip perhaps for three months to come. There are several reasons for the apparent delay. In the first place winter is coming on and it might not be so convenient to continue the work on her while afloat as while she is propped up on shore, and in the second place the space which she occupies is not needed for any other purpose. To a casual observer she looks little like a United States warship at the present time. A large part of her body has not yet been sheathed and the riveting hammers continue to drown out all other sounds in the vicinity. Her rusty iron sides look far from pleasing and to the uninitiated she might appear to be only in the preliminary stages of construction. There is a wide difference, however, between what the average person—and even a careful writer—considers to be the advanced stages in the building of a warship and the views of the government on the same subject. The former, for instance, thinks it in the preliminary stages until the sheathing begins, or at least until there is some resemblance to a vessel; the government thinks it past the preliminary stages after the material has all been bought and the various parts have been molded into shape in the workshops, to be fitted together in due time. Thus it is that although there is nothing to show on the ground to be occupied by the battleships Rhode Island and New Jersey, the Fore River Works officials consider the vessels well advanced because the various parts are ready in the workshops. One of the most interesting parts of the yard is the pattern shop, where the patterns for the seven-masted schooner receive the attention daily of a dozen or more workmen; and at one end of the loft are two models showing the starboard and port sides of the ship, prepared so carefully as to minute detail that hundreds of little sections are drawn out, showing just how heavy each plate will be when the schooner is sheathed.

The torpedo boat destroyers Lawrence and Macdonough lie side by side at one of the piers of the company, and Tuesday the former had her first trial spin in several weeks. It was found after a number of tests that the propellers which were first placed at her stern were not of the quality to bring out the speed of 30 knots called for, so a month or more ago she was laid up while new ones were made. These came a few days ago, and on the first trial they gave perfect satisfaction. The officials are confident that she soon will be ready for the government trial.

Two immense oil tanks for the cooling and hardening of shafts are now well along toward completion in one section of the yard; the foundation has been laid for enlarging the power plant; and similar progress has been made toward the extension of the machine shop for a considerable distance.



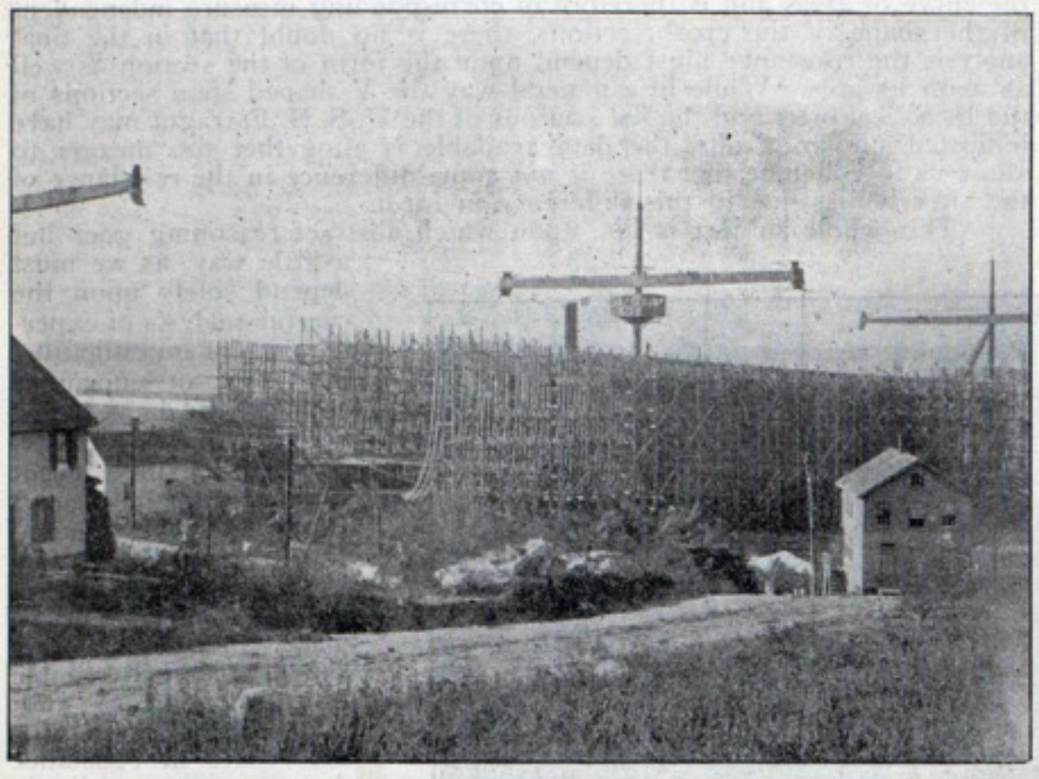
Freight Steamer James J. Hill, one of four ships that are the largest on the Great Lakes.

Repeated inquiries regarding capacity, dimensions, etc., of the largest ship on the great lakes prompts the Marine Review to print the above engraving. The steamers James J. Hill, Wm. Edenborn, John W. Gates and Isaac L. Elwood, four ships that are duplicates in all respects, are the largest vessels on the great lakes. Their dimensions are: Length over all, 498 ft.; length of keel, 478 ft.; beam, 52 ft.; molded depth, 30 ft. The largest cargo ever moved on the great lakes was loaded at Two Harbors, Minn., and delivered at Conneaut, O., by the Wm. Edenborn this season (1901) and consisted of 7,454 gross or 8,348 net tons of iron ore. These vessels are owned by the Pittsburg Steamship Co., the organization that manages lake vessels of the United States Steel Corporation and of which Mr. A. B. Wolvin of Duluth is general manager. They represent the highest practice in the construction of freighters for lake service. They are equipped with quadruple-expansion engines, Babcock & Wilcox water-tube boilers, mechanical stokers of the kind made by the Duluth Stoker Co., Duluth, Minn., and other modern devices that make them up-to-date ships in all respects.

A three-masted schooner, building by William E. Woodhall & Co., Baltimore, Md., has the hull planked, deck frames in place and deck planking being laid. The vessel is 117 ft. long, 29 ft. keel and 8½ ft. depth of hold.

NOVEL SYSTEM OF OVERHEAD TRAVELING TROLLEYS.

The most interesting feature of the newly established plant of the Eastern Ship Building Co., New London, Conn., is the novel and ingenious system of overhead traveling trolleys that has been devised for transporting and handling material over the building stocks, upon which now rest the mammoth cargo and passenger steamships that are building for the Great Northern Steamship Co. The trolley system consists of three large lofty spars or masts of circular section, located 300 ft. apart, upon each of which is carried a large yard or cross-bar of rectangular section about 6 ft. square. Upon each of these cross yards is placed a track to give athwartship motion to carriages, to which is connected cable ways. These carriages place the trolley cables in any athwartship position of the ship desired. Upon each cable way is a wire rope carriage with hoisting sheaves and the necessary attachments, these carriages running along the cable way, giving a fore-and-aft motion, besides doing the required hoisting and lowering. Plates, frames, beams, or any other parts of the ship or construction members can be picked up at any part of either ship. There is practically no limit to the number of independent trolleys that



OVERHEAD TRAVELING TROLLEY SYSTEM AT EASTERN SHIP BUILDING CO.'S YARDS, NEW LONDON, CONN.

can be used in such a system as this. All the operating machinery is located in a house connected to the middle mast, just below the cross yard on same. The structure is held in position by wire rope guys. At the water end, a steel compression member or strong-back is located to assist the water guys. The wire rope is all of special quality with little stretch, and the structure is elaborately guyed and braced. It is said to be the most efficient means of handling material over ship building slips that has yet been devised. Electricity is used throughout as a motive power, and the system is said to give complete satisfaction, being very rapid and reliable in its work. It has been designed and built throughout by the Eastern Ship Building Co.

MR. HENRY W. PEABODY ON OUR MERCHANT MARINE.

Henry W. Peabody of Boston recently visited the president, and upon being asked the object of the visit, he said: "It is to interest those who have to do with the forthcoming message to advocate a bill which will be really for the creation of a merchant marine." Mr. Peabody says that he can see no prospect of such an outcome from the Frye bill, either in its old form, or in what he understands to be its present shape. Senator Frye's own analysis of his bill as presented to congress, he says, shows that he anticipates the addition in five years of 900,000 tons to our merchant marine, good and bad and old and new. One-third of that would be admitted from abroad, leaving but 600,000 tons to be built in this country in the next five years. This, says Mr. Peabody, would give us a total of only about 1,700,000 tons, which is by no means sufficient. England has a tonnage at the present time of 14,000,000 tons and is adding to it very rapidly. If Mr. Frye thinks the prospect under his bill of an adequate merchant marine is good Mr. Peabody begs to differ from him.

"I have for a great many years believed," said Mr. Peabody, "that if vessels could be admitted for a term of years from abroad, limited to the foreign trade, they would have been procured by American citizens and placed under the American flag; and when the recommendation of President McKinley was made in 1898 that the principles of the law of 1892, by which the Paris and the New York were admitted, should be continued for a term of years to our citizens, it met my entire approval. For every vessel admitted they should build another in this country, and we should stimulate the operation of them by a subsidy on the mileage. That I considered a grand idea. If it had been put into law three years ago, with the enthusiasm which then prevailed, our people would have brought from abroad one or two million tons, and would have lodged absolute contracts with our builders to reproduce the same amount here."

Mr. Peabody believes that Mr. Frye has always stood as a champion of the ship builders, but that this is not what the subsidy is intended for, and that the ship builders would have been wiser had they been content in the past with less. He thinks that the president's recommendations will be general, and will not directly urge the Frye bill, or its equivalent. The words of the Massachusetts platform, he adds, afford a good general statement: "We favor government aid in building up our merchant marine upon a just and equitable basis towards all American citizens."

The John M. Rogers Boat, Gauge & Drill Works, Gloucester City, N. J., has received a contract to build a launch for the Louisiana state board of health, Mississippi river quarantine station. The launch will be 30 ft. long.

ANDREW CARNEGIE ANSWERS SOME QUESTIONS.

Mr. Andrew Carnegie arrived in New York this week and was besieged by a number of representatives of newspapers for his views on public questions. He dodged most of them, but the following replies are interesting. He was asked if he had heard of the plan to organize the leading British iron and steel making companies into a combination similar to the United States Steel Corporation.

"Yes, I have heard of it; but you know I am not in business now. I have reformed."

"Is it feasible?"

"The English do not co-operate as easily as the Americans. Emerson said that every Britisher was like an island."

"Mr. Schwab," said another reporter, "says that the Connellsville coal region would be exhausted in thirty years and the Lake Superior iron ore region in sixty years."

"Schwab will not be exhausted in thirty years," was the quick reply. "He is young yet."

"Have you any views on the isthmian canal question?" was next asked.

"I have decided views."

"Are you in favor of the Nicaragua canal?"

"Decidedly not. I do not believe the Nicaragua canal would be workable if built. The Panama canal might be workable. I do not believe a canal could be made to render half the service a first-class double-track railroad, with good shipping facilities at either end, would. You can unload freight from vessels on 50-ton cars and reload it on the other side at far less cost than the mere running of a ten thousand ton ship through the canal, even if no toll were paid."

Mr. Carnegie was asked whether he would favor such a ship railroad as the Tehuantepec project of Mr. Eads.

"They are building a railroad there now, but not of this kind," was all Mr. Carnegie had to say about the scheme.

"Then you do not favor the Nicaraguan canal?"

"It is only sentiment that is behind it. It is not good sense."

"What have you to say about reciprocity?"

"Reciprocity is an easy word to say, but when you come to arrange the details it is a difficult policy to inaugurate. I had many talks with my dear friend Mr. Blaine on that subject."

"Blaine believed in it, did he not?"

"Yes, at first, but in the light of further experience I think Mr. Blaine did not believe in it so much. The best plan is to reduce the protective duties. You can arrange reciprocity with one country, but that country favors you at the expense of all others. You can't have reciprocity without making enemies. Washington's policy was the best: 'Be friends with all nations, allies with none.'"

AN EXTENSIVE NAVAL PROGRAM.

The naval program which Secretary Long will submit to congress at its coming session is an extensive one. The plans for the two armored cruisers and two battleships projected by congress at its last session have been prepared and provide for the construction of battleships of nearly 16,000 tons and cruisers of 14,000 tons. The additional program, outlined by the naval board, is as follows:

Three seagoing battleships of about 16,000 tons displacement.
Two armored cruisers of about 14,500 tons displacement.
Six gunboats of about 1,200 tons.
Six gunboats of about 600 tons.
Six gunboats of about 200 tons.
Two colliers of about 15,000 tons.
One repair ship of about 7,500 tons.
Six training ships of about 2,000 tons.
Four picket boats of about 650 tons.
Four tugboats.

This program is not in the aggregate any greater than that which was submitted to congress at its last session and which was so mercilessly slashed by congress.

GRAND TRUNK ELEVATOR AT MEAFORD.

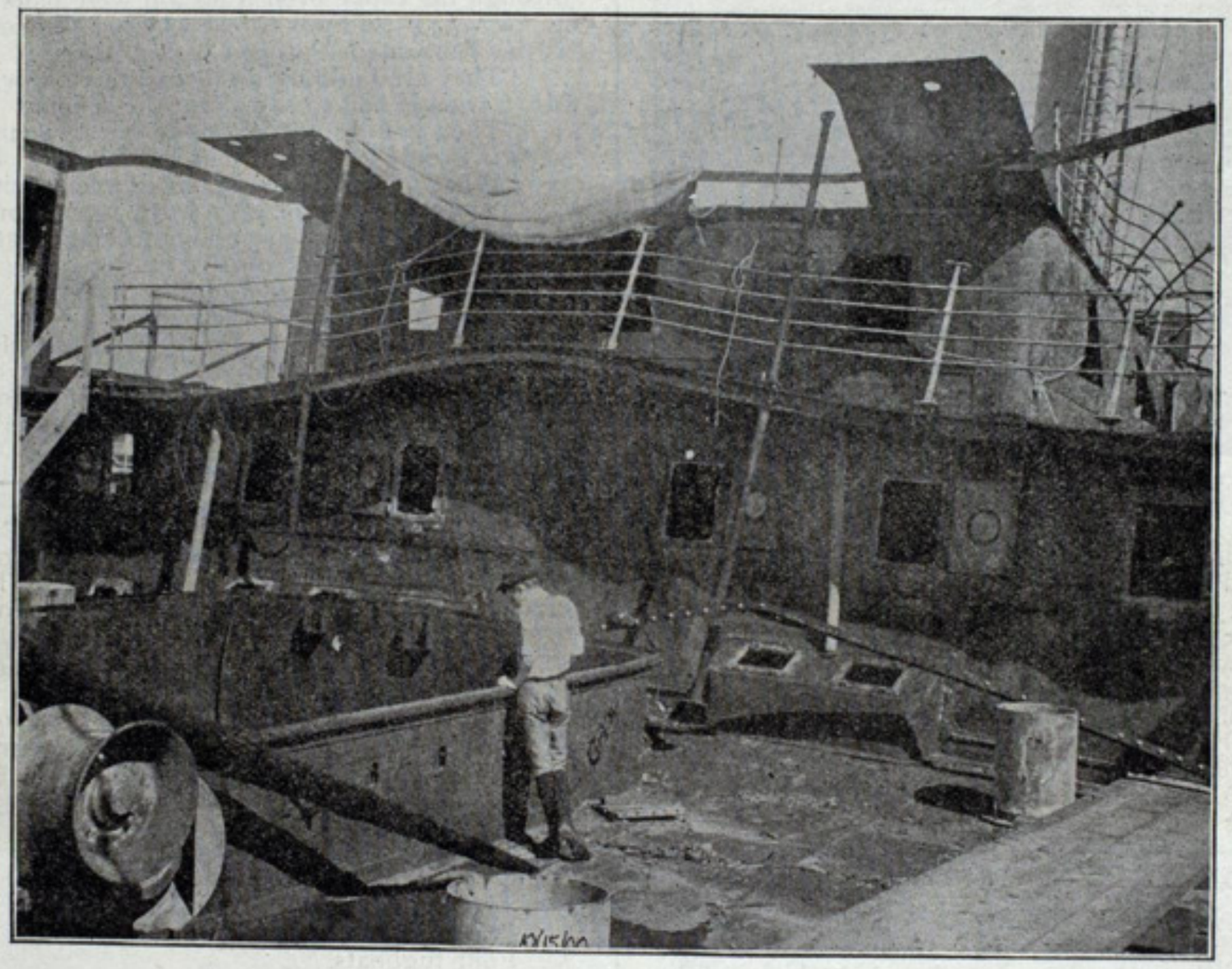
There has recently been completed at Meaford, the Collingwood branch terminus of the Grand Trunk railway on Georgian bay, 480 miles by steamer from Chicago and 430 miles by rail from Montreal, what is said to be the fastest single-leg marine elevator on the lakes. It has a working house of 150,000 bushels and a storage annex of 600,000 bushels. The foundation is of concrete and the deck is a solid concrete pier 28 ft. deep. The floors also of the elevator are all concrete while the superstructure is of laminate work. The bins were built of 2x8, 2x10 and 2x6 hemlock timbers, the balance of the timber being Norway pine. The elevator is entirely covered with corrugated elevator siding, painted black. The marine leg is of steel with capacity of 15,000 bushels per hour. The inside lifters have cups 32x7x8 in., the belt traveling 700 ft. per minute. There are four conveyors made of 40-in. rubber belting, traveling 1,000 ft. per minute, and there is a full equipment of steamship shovels. The elevator drives by rope transmission throughout. There are four 1,200-bushel hopper scales of new pattern, adjustable, and four bifurcated loading spouts for loading cars, with track room for loading 200 cars per day of ten hours.

It is expected that the Wolvin building in Duluth, in which will be housed the mining and transportation interests of the United States Steel Corporation, will be finished early next spring. The building will occupy a site 100 by 140 ft. on the corner of Third avenue, West and First streets and will be seven stories high. The architecture is renaissance, the first two stories being of red stone and the rest of gray brick. Above the second floor the shape of the building will be an L, the inner rear corner being left as a wide light shaft, so that every room in the entire building has abundance of direct outside light. There will be twelve offices upon each floor. There will be three elevators placed well in the front of the building and in prominent view. The main entrance and stairway will be finished in selected Italian marble with panelings relieved by glass mosaic. The architects are Palmer, Hall & Hunt of Duluth.

NORTH GERMAN LLOYD STEAMSHIP MAIN.

Newport News, Va., Nov. 6.—The work of rebuilding the North German Lloyd Steamship Co.'s twin screw steamer Main, which was partially destroyed in the Hoboken fire in June, 1900, has been completed at the works of the Newport News Ship Building & Dry Dock Co. and she has just loaded at Baltimore a general cargo for Bremen, her home port, whither she goes to be refitted for passenger service between Bremen and New York. It required just one year to rehabilitate the Main, to transform a mass of bent plates, twisted stanchions, warped decks and charred woodwork into a leviathan of symmetrical lines stanch enough to weather the most furious seas. The Main arrived at the ship yard on Oct. 13, 1900, in tow of five tugs, which brought her from New York. On Oct. 15 the work of rebuilding the vessel from the light-water line up was begun. She was delivered to her owners on Oct. 15, 1901, and sailed from Newport News for Baltimore last Thursday. The Main was reconstructed at a cost of about $600,000. It was an immense undertaking, and its execution to the satisfaction of the inspectors representing the North German Lloyd Steamship Co. and the surveyors acting for the classification bureau, Germanischer Lloyd, demonstrates that American ship builders are skilled in the trade and are strong competing factors with which foreign ship builders must in the future reckon. It is reasonable to assume that, could the Main have been repaired in Germany or England at less cost than that for which the work was performed in the United States, the ship would have been taken across the Atlantic.

To rebuild the German steamer required the steady employment of 1,000 workmen. After mooring the hulk of a once magnificent vessel to a wharf the workmen began tearing away the temporary erections and fittings which had been put on the ship to enable her to be brought to Newport News. Then all the fittings, beams and deck plating which were to be removed and used again in the reconstruction of the steamer had to be marked. This done, workmen began cutting loose and removing the bent and warped plates, fittings, masts, etc., stripping the ship of everything except her ribs, the total tonnage removed being about 3,000, of which one-fourth was renewed. The total number of plates removed and replaced was 1,800, showing the great damage wrought by the fateful fire. In addition to this 1,003 beams were removed and replaced. This material was handled by floating derricks, was placed on scows and landed on the wharf, from which place such of it as could be used was taken to the furnaces and straightening rolls. Perhaps the statement that the daily average of rivets punched and drilled out was 5,500 will give an idea of the immensity of the work performed. The worst effects of the fire were apparent forward of the boiler space, through the saloon and in way of hatch No. 3. Here every deck was badly buckled and in some places they dropped 3 ft., making it impossible for a man to stand upright 'tween decks. The stanchions were bent and twisted and the center line bulkhead, from the double bottom to orlop deck, was also buckled and bent. Even the masts had to be removed.



DECK VIEW OF STEAMSHIP MAIN BEFORE RECONSTRUCTION.

All material, such as deck stringers and shell plates, which were not badly damaged by the intense heat, were annealed, straightened and replaced. After the ship was stripped she was placed in the dry dock, where she remained from April 23 to Aug. 14, while the stringer plates were reriveted, the remaining shell plates removed, annealed and replaced and other work performed. While this work was in progress the engines were being overhauled, repairs made to the plumbing, heating and electric lighting systems. The work of fitting out the Main for passenger service will be done in Germany, as this was not covered by the contract with the Newport News company. Of course, well-appointed quarters were fitted up for the officers and crew who will take the vessel to Bremen.

The Main is again a first-class steamship. As soon as she is equipped for passenger service she will resume her place on the line between New York and Bremen. She is a fast twin-screw steamer of 10,000 gross tons, has four decks, is 501 ft. long, 58.1 ft. wide and 36.6 ft. deep. She is fitted with electric lighting plant, refrigerating machinery and other modern appliances. The contract for reconstructing this steamer was one of the largest ever executed by an American ship yard for a foreign company. The master of the Main is Capt. R. Dahl.

HULL DESIGN.

GEORGE CROUSE COOK.

In a recent issue of the Marine Review (Sept. 26, 1901,) appeared an article of my composition on "Hull Design," in which I show a method of constructing a curve of sectional areas or longitudinal disposition of displacement, from which a line draft of the correct form and known qualities may be constructed. I have been favored with notes of the highest value in reference to this article from such leading naval architects as Prof. Durand, Prof. Peabody and Naval Constructor Taylor, and these show an error which I can now correct.

The authority of these gentlemen states that there is no present justification of the acceptance of a "form of least resistance," as was claimed for the form developed from a trochoidal-versine curve of sectional areas. It is agreed, however, that these curves approximate to those of this form, now unknown, and may be used as a satisfactory basis from which to develop the desired curve of sectional areas or to construct a line draft of known displacement and center.

Prof. Durand of Cornell has written most freely, and I have therefore gained his permission to present herewith his notes, which, although dictated hurriedly without a view to publication, will give the most advanced idea of the subject:

"In my opinion there is insufficient experimental foundation for the belief that a 'form of least resistance' is given by a combination of trochoid and versine as described. There is no doubt, of course, that such a form would have low resistance and presumably not far from a minimum; but that this peculiar property resides in a form determined by these curves is by no means proved and is very doubtful. Furthermore, while as a general proposition the resistance of a body is in large measure determined by the curve of areas and is therefore in corresponding measure independent of the shape of the cross sections, there is no doubt that in the final analysis the resistance must depend upon the form of the section as well as upon its area. While in a general way the V-shaped stem sections of the U. S. S. Porter and the flat sections of the U. S. S. Farragut may have indicated similar results, the data available is altogether too meager to allow us to conclude that there is not some difference in the resistance of the after bodies due to this difference in form.

"This whole subject is one upon which abstract reasoning goes but a little way, as we must depend solely upon the careful analysis of experimental investigation. There is an enormous amount of data stored away at the various experimental tanks, but it is unfortunately not available to the general student, and, as a matter of actual fact, the general investigator is unable to place his finger upon sufficient data to enable him to form any very just idea of the minor differences in resistance due to correspondingly minor differences in form.

"The so-called 'form of least resistance' is in itself only of indirect interest to the naval architect. It is quite sure that the 'form of least resistance' for one set of conditions would not do for another and that even if we knew such a form it is probable that other considerations would force departures from it in various details. It is especially true, of course, that the 'form of least resistance' for still water is not the best for a ship in a seaway. These and many other like considerations indicate that the 'form of least resistance' in itself is of abstract rather than actual interest and what is desired is not so much the form of least resistance for still water or under ideal conditions, but rather the best combination of qualities suited to the average conditions which the proposed ship is to fulfill. This will inevitably call for some departure from the ideal form."

This from Prof. Durand will definitely determine the present conditions of the matter and broaden the ideas of most readers on the "form of least resistance."

RECORD MONTH IN IRON AND STEEL OUTPUT.

October was the greatest month in the history of the Carnegie mill at Duquesne in the output of iron and steel. In the Bessemer department 55,521 tons were produced, which is a gain of 2,332 tons over the world's record for one month. In the open hearth department 40,321 tons of steel were turned out, which is 1,917 tons over the world's record. At the 21-in. mill 51,936 tons of billet steel were made, 3,859 tons above the world's record. The 10-in. merchant mill was started Oct. 5 and for the remainder of the month 3,455 tons of finished steel was produced. The Homestead steel works also broke the previous monthly records in October for the production of armor plate steel sheared and universal plates, structural material, steel bars, angles, Bessemer and open-hearth ingots, blooms and slabs. The total will be 10,000 tons above the highest production of any previous month. One turn in the 34-in. mill turned out 2,500 tons, against 2,200 previously. The structural steel departments are two and three months behind orders. During the month the last of the Russian contracts for armor plate were finished and the entire capacity was placed on the American contracts, which the navy department is anxious to have rushed. The armor plate department will be doubled. It has been decided to place a 12,000-ton press in the new department. This machinery will be the largest ever made. The plate mills are nearly as congested as the structural and armor plate mills because of the heavy specifications made by the Pressed Steel Car Co. under its ten-year contract.

For navigation charts apply to the Marine Review.

LAKE SHIP YARD NOTES.

It has been decided to put off until next spring the work of moving to the seaboard the two large steamers that are building at the Cleveland works of the American Ship Building Co. for transatlantic trade. It was expected that one of the vessels would be taken about this time in two parts to Montreal, there to be put together, and that the second vessel would follow early next spring, but unavoidable delays have compelled the builders to put off the completion of both ships until the opening of navigation next year. These are the vessels that are building for interests represented by Chas. E. & W. F. Peck of New York. They are to carry about 7,000 tons on ocean draught and are to be suited for trade in all parts of the world. As far as can be learned the Craig Ship Building Co. of Toledo still hopes to deliver to the United Fruit Co. in New York before the close of navigation the two steamers of Canadian canal dimensions which they are building for the fruit company's West Indian trade. These vessels are to be named Watson and Buckman. They have been built at a cost of about $190,000 each.

J. E. Botsford and others of Port Huron, who have a large contract with the Grand Trunk railway for the transportation of freight (principally grain) on the great lakes, are going ahead with plans for the ship yard which they propose to establish at Port Huron. Prof. Wm. F. Durand of the school of naval architecture and marine engineering at Cornell university has been acting in the capacity of consulting engineer with the promoters of this enterprise and has planned a type of grain carrier that involves some features of construction radically different to the ordinary grain carrier of the lakes. It is probable that the first ship at the new St. Clair river yard will be built according to the new design. The yard as planned is to be suited to putting down two steel ships in the beginning, but it is said that the Grand Trunk service as now outlined will require eight, and that the other six will be built as rapidly as possible. It is expected that everything will be in readiness at the St. Clair yard to put down a keel about March 1 next. The first vessel is to be 405 ft. in length over all, 50 ft. beam and 30 ft. depth.

Probably there is some truth in the report from Buffalo that the Anchor Line (Pennsylvania railroad connection on the lakes) is to build three steel passenger steamers for Buffalo-Duluth service, as the steamers India, China and Japan now in that service are old wooden vessels that must soon be replaced by modern craft if the line is to be kept up, but the new vessels could not be completed, even if they were ordered now, until the spring of 1903, as the ship yards have all they can do until well into the middle of next summer. If the new ships are ordered they will no doubt be modern in all respects.

Geo. B. Drake, who has resigned the superintendency of the Buffalo works of the American Ship Building Co. to undertake the practice of representing owners or underwriters in surveying, looking after the construction of vessels, etc., is very highly spoken of by President Edward Smith of the Buffalo yard and others who have a knowledge of his work during several years past. Mr. Drake has been succeeded by Al. Smith, son of the late John Smith of the old Globe works, Cleveland. Mr. Smith is a young man who has had a thorough training at the Lorain works of the American company.

The work of superintending construction of the lighthouse steamer Hyacinth, to be built by the Jenks Ship Building Co. of Port Huron for the engineer of the ninth lighthouse district, will be conducted from the office of Walter Miller, Cleveland.

Frank M. Osborne is the name selected for the first of the five steamers building for J. C. Gilchrist and others by the American Ship Building Co. Mr. Osborne is president of the Pittsburg Coal Co.

An estimate semi-officially given out is that the earnings of the United States Steel Corporation for October, November and December will be $30,000,000. For the first six months of its existence the corporation earned $54,000,000, or an average of $9,000,000 a month.

Capt. T. J. Garlick, Pittsburg, Pa., has contracted with Andrew Axton & Sons, Brownville, Pa., for a hull for a new sand dredge.

WORKS OF THE SHIP OWNERS' DRY DOCK CO.

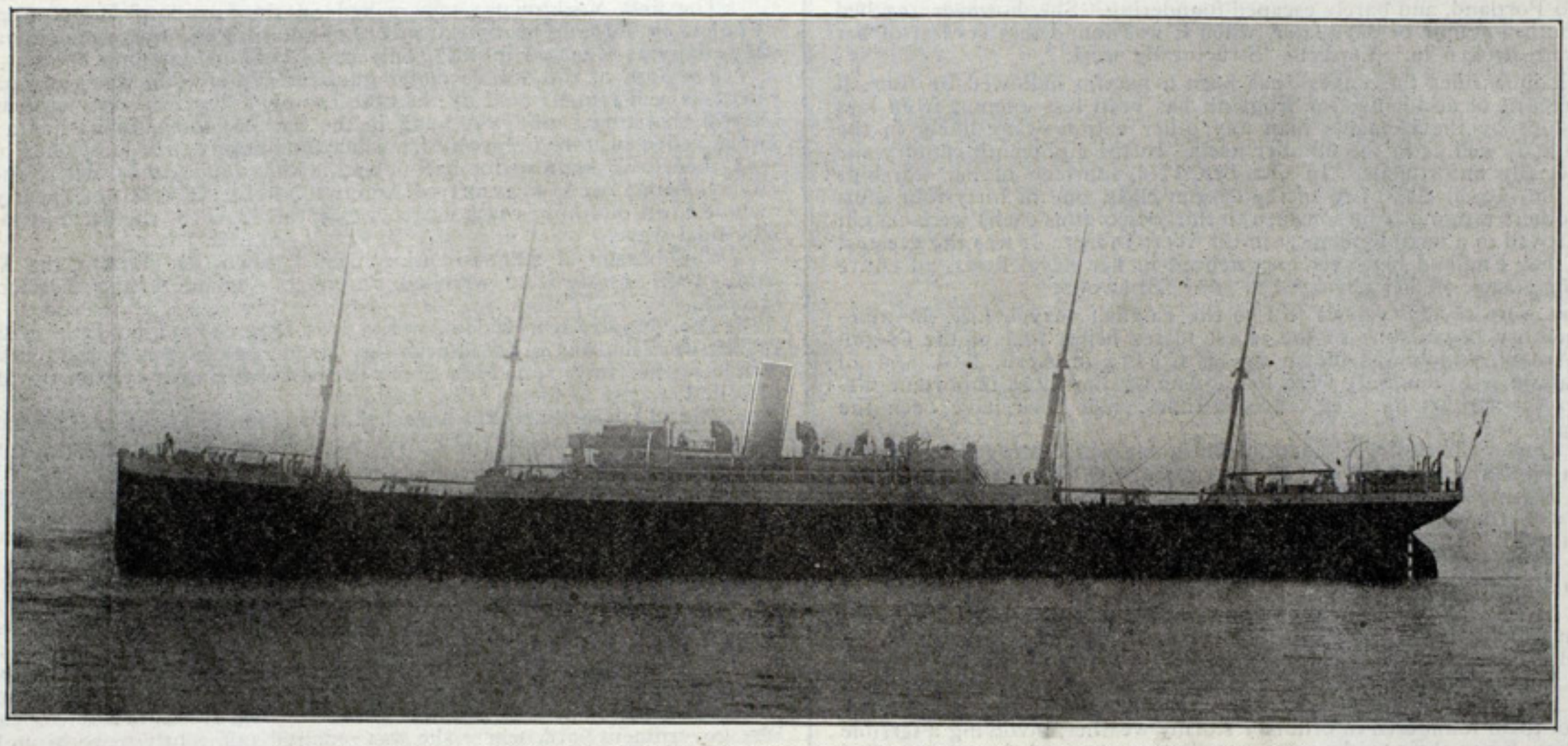
Chicago, Nov. 6.—The work of converting the plant of the Ship Owners' Dry Dock Co. into a modern dock yard has proceeded so rapidly this summer that a steel ship was put into the No. 2 dock last week. This is the first steel boat ever docked in Chicago river for repairs which were to be entirely made in the same yard. Before the Chicago Ship Building Co. built its large dock, steel steamers were docked in the north branch yard, then owned by Miller Bros., and the new plates and frames brought to them on tugs from South Chicago—a slow task, which was not often attempted except when the Milwaukee docks were filled with work.

The largest dock of the Ship Owners' plant will be in readiness for ships by the close of navigation. It measures 480 ft. in length, 84 ft. width on top and 60 ft. width at the bottom. There will be 17 ft. of water over the miter sill, and it will take any ship that can be brought up the north branch of Chicago river for some time to come. Lying on the point of land at the junction of the river and the Ogden canal, the dock can be entered without any turning. The cofferdam around the front of the dock was completed last week, and the dock pumped out for the bottom piling to be driven.

The middle dock of the yard is to be lengthened to 335 ft. when the new dock is completed. The other dimensions will be in proportion. The third dock, lying beside North Halsted street, has been shortened to 160 ft. in length for sailing vessels, tugs and small steamers. Over the place where the end of the dock extended the office building will be erected, with the offices on a level with the viaduct and the lower part of the building utilized for a storehouse.

The shops are all built, and the machinery for handling steel plates and shapes is being installed. The equipment of the yard will be modern in every respect, pneumatic machinery being installed, and a railroad has been laid all around for the self-propelling cranes. Things will be so arranged that these cranes can carry a plate from the machine shop to the side of the ship in dock without a second handling.

The Ship Owners' company has not attempted to install a plant for machinery repairs, as there are many excellent shops of this kind in the immediate vicinity, and repair work alone would not furnish sufficient employment for a modern machine shop. The company has purchased a tract of land north of the section which was formerly owned by Miller Bros., and here it is proposed to lay down a steel steamer in the course of the next year. The managers of the company have devoted their energies first of all to perfecting their dry dock plant, and the ship building will come later. If an order is not forthcoming at the right time, the company may lay a keel on its own account. The keel blocks will be laid along the Ogden canal and the launching will be made right into the canal. There will not be room for any very large ship, but plenty of space for a passenger steamer or medium-sized cargo carrier.



STEAMSHIP MAIN AS SHE APPEARS AFTER RECONSTRUCTION BY NEWPORT NEWS COMPANY.

FAST LINE TO CANADA.

It is announced that Lord Strathcona, high commissioner for Canada in Great Britain, who visited Canada to help in the reception of the duke and duchess of Cornwall, has with him the plans for a fast ocean service between Canada and Great Britain, almost to the final stage. It was by Lord Strathcona's influence that Sir Christopher Furness, the great steamship builder and owner, was induced to visit Canada to investigate the fast mail project and the advantages offered for the manufacture of steel. Equally it is largely to Lord Strathcona's efforts that the imperial authorities, after years of dilly-dallying, at length took up the consideration of fast mails with the Canadian government in serious earnest. The result is that the only questions that now remain to be settled are the amount of the subsidy to be voted by the two governments and practical steps to secure the reduction of insurance rates, which now discriminate so severely against Canadian ports. The capitalists who are ready to build the fleet of new steamers required asked a larger subsidy than the two governments were prepared to grant. These difficulties are in a fair way toward adjustment, and it is believed that Lord Strathcona's return to London in a few days will be followed in due course by an announcement that the contracts have been let and the fast line scheme actually launched.

WASTAGE OF THE NAVIES.

STORMS DO INFINITELY MORE DAMAGE TO THEM THAN WARS—A LONG LIST OF DISASTERS.

That war vessels are not exempt from destruction by the elements any more than are the rank and file of the merchant marine is proved by the large number of disasters that have overtaken them at comparatively short intervals. The frequency of disasters recently to torpedo boats has caused discussion among naval experts as to the advisability of continuing to add these boats to the fighting squadrons. The torpedo boat is a complicated, densely packed box of machinery, built as light as possible in order to obtain the highest possible speed. The hull is of steel, not more than a quarter of an inch thick, and while the frames are so constructed as to make the hull fairly rigid the frequency of accident proves that they have faults which it has not yet been possible to avoid. There is only this thin sheeting of steel between the crew and death at all times, the risks being increased by the amazing pace at which these craft cut their way through the water.

One of the most serious catastrophies to this class of war weapons occurred on Sept. 18, when the torpedo boat destroyer Cobra foundered at sea, and of the seventy-nine persons on board only twelve were saved. The accident has been variously ascribed to a collision with a submerged wreck, a whale and a hidden shoal. The court of inquiry's verdict is that she "simply collapsed because she was structurally weak." The fact remains that she was wiped off the naval list from battle with only an ordinary storm. Only a few weeks later, on Oct. 10, the English torpedo boat destroyer Vulture buckled up in heavy seas while on her way from Portsmouth to Portland, and barely escaped foundering. She, however, reached Portsmouth a couple of days later, when it was found that several of her plates were broken in. Verdict—"Structurally weak."

"Britannia rules the waves" has been a maxim hallowed by time, if not by record of accidents; for England has been less exempt from loss of her ships by the elements than any other nation—very likely in the percentage as well as in the number itself. In the eighteenth century she was especially unfortunate. In October, 1770, fourteen of her warships (one of the 74-gun class, two of the 64-gun class, one of forty-four guns and the others ranging from fourteen to thirty-two guns each) were caught and destroyed in a terrible tempest in the West Indies. It was the greatest disaster that England had ever experienced in her naval fleets, an entire fleet being struck off her naval list at "one fell swoop."

There were several vessels lost to the English navy before the nineteenth century began, one of the worst losses being that of the 68-gun frigate Ardent, which was blown up off Corsica in April, 1794, and all hands (about five hundred) were lost. Among the most important disasters to the British navy at different times since then have been the following:

The Queen Charlotte, a frigate of 110 guns, was destroyed by fire off Leghorn on March 13, 1800, and of the crew of 859, 663 were lost.

The Invincible, a frigate of seventy-four guns, was wrecked off the coast near Yarmouth on March 16, 1801, and of the crew of 590 more than 400 perished.

The Venerable, another 74-gun frigate, was wrecked at Roundem Head on November 24, 1804.

The Maria was one of a large number of the 10-gun brigs that were lost from time to time, not a soul being saved. She foundered at sea in 1807, and no one survived. These 10-gun brigs were built during the war between England and France, much after the manner of the 90-day gunboats of the American navy, and were almost all unfit for sea. A large number of them foundered in ordinary stormy weather, involving a terrible loss of life. From their tendency to turn bottom upward they were called turtles, hence the term "turning turtle" in the marine vocabulary.

The Martin seems to have been an unlucky name for Britain's navy, for three of them—of sixteen, eighteen and twenty guns, respectively—foundered; one in 1800, another in 1806 and the third in 1826, not a soul being saved. The fatality which followed the 10-gun brigs also seems to have attended the sixteen and eighteen gun sloops, judging from the fatality list of England.

The 64-gun frigate Atheneum was wrecked near Cape Bon on Oct. 20, 1806, and 350 lives were lost.

The Java, a 32-gun vessel, foundered off the island of Rodriguez, Indian ocean, in February, 1807, and not a soul was saved.

The Magicienne, a 36-gun vessel, was wrecked in an engagement with the French off Mauritius on Aug. 23, 1810.

The 74-gun frigate Minotaur was wrecked off the mouth of the Texel, Dec. 22, 1810, and of a crew of 640 more than 400 were lost.

On the coast of Jutland, on Dec. 24, 1811, the 98-gun frigate St. George and two 74-gun frigates—the Defence and the Hero—foundered in a tempest. Of the total number of people on the three ships (about 1,800), not twenty were saved.

The frigate Atlanta was wrecked on Sambro Island on Nov. 10, 1813.

The Delight, a 16-gun brig, foundered in a hurricane near Mauritius on Feb. 23, 1824, and not a soul of the crew of seventy-five was saved.

The frigate Avenger was wrecked in the Mediterranean on Dec. 20, 1847, and only four of the crew of nearly 300 escaped drowning.

The Raleigh, a 50-gun ship, was wrecked on the southeast coast of Macao on April 14, 1857.

One of the most mysterious disasters of the British navy was the loss of the turreted ironclad Captain. She was capsized and foundered off Cape Finisterre, Spain, on Sept. 7, 1870, and only seventeen escaped of nearly 500 on board.

On Sept. 1, 1875, the cruiser Vanguard was run into and sunk by the ironclad Iron Duke

Less than a year afterward, on July 14, 1876, one of the boilers of the battleship Thunderer exploded, when forty-five of the crew were killed outright and about fifty were more or less injured. The same vessel exploded one of her 38-ton guns on Feb. 12, 1880, when ten of the crew were killed and forty or more wounded.

On March 24, 1878, the training ship Eurydice foundered in a gale off the Isle of Wight, when 300 lives were lost.

On March 6, 1889, the ironclad Sultan was wrecked by running ashore on the Maltese group.

One of the most remarkable and almost unaccountable disasters in the British navy was that of the battleship Victoria, which was sunk by collision with the battleship Camperdown on June 22, 1893. Of the people on board there were nearly 400 lost, including Admiral Tryon.

There have been disasters in other navies as well, but not so large a proportion as in the British navy. The United States navy has not been exempt by any means, but while there has been more or less criticism of American naval officers, and some have suffered the penalties of the court martial, there has been a smaller percentage of losses than in the English service.

"What's in a name?" is an old and familiar maxim; but there is a good deal, in the opinion of many naval men, to encourage superstition when one recalls the losses of some of the ships. For instance, the people of Boston felt honored when one of the first vessels to be built for the modern steel navy was named the Boston, but she was not the first. The first Boston, built in that city in 1776, was a 24-gun frigate, but she was captured at Charleston, S. C., when that city succumbed to the British during the revolution. Boston No. 2 was sunk in the battle on Lake Champlain in 1813, she being one of Arnold's flotilla. Boston No. 3 was burned in 1814 at Washington, to prevent her falling into the hands of the enemy. Boston No. 4 was lost in the West Indies in a hurricane in 1846. Boston No. 5 is still afloat, but she has met with several accidents, more or less important.

The United States navy has had four Philadelphias, the first being wrecked on a reef off Tripoli in 1803; fell into the hands of the barbarians; was recaptured by Decatur, after being raised by the Algerians, and burned by him. The second and third of this name were also lost—No. 2, under Arnold, being sunk in battle in 1812 on Lake Champlain, and No. 3 was sunk by torpedoes in the civil war.

The first Yorktown was wrecked on the island of Mayo, Cape de Verdes, in 1850. The first Concord, built in 1828, was wrecked in the Mozambique Channel in 1843, only three persons escaping.

The loss of the double ender gunboat Wateree, in 1868, at Iquique, Peru, is well remembered by the officers now living who were attached to her at that time. She was lying in the harbor at the time when a tidal wave rolled in, tore her away from her anchorage, then swept her out to sea, then back again to the harbor and inland about a mile, where she lies today, being used as a sort of summer hotel. At that time nearly the whole town of Iquique was destroyed by the shock of the earthquake and the tidal wave.

The disaster at Samoa in March, 1893, when the Trenton, the Nipsic and other vessels were wrecked, is one of the interesting disasters on record.

The sloop-of-war Galena was a loss that excited no little criticism at the time she was wrecked near Gay Head Lighthouse, in good weather, while on her way from New York to the New England coast on March 14, 1891.

The old Kearsarge, the vessel that fought the privateer Alabama off Cherbourg, on June 19, 1864, was wrecked on Roncador Key, Gulf of Mexico, on Feb. 9, 1894.

The battleship Maine, the vessel that is credited with precipitating the war with Spain, was blown up in the harbor of Havana, Cuba, on Feb. 15, 1898, and her "wet" bones still lie at the bottom of that harbor.

The Yosemite, a war vessel converted from a merchant vessel, was wrecked on a reef at Guam in November, 1900. Five persons were lost.

The cruiser Charleston, which cost the government $1,500,000, was wrecked on a reef near the island of Camaguin, Philippines, on Nov. 2, 1899.

The battleship Oregon barely escaped being wrecked at the time of the Boxer war in China, stranding on a reef about thirty miles northeast of Che-Foo, in June, 1900. She was afterward floated and taken to a Japanese government yard, where she was repaired sufficiently to be brought to the United States. She is now at Boston.

NEW DRY DOCK AT HAVANA.

A new commercial floating dry dock of 5,600 tons capacity has just been completed and is now ready for business in the port of Havana, Cuba. It is owned by the Havana Dry Dock Co., Havana, and is operated in conjunction with the Havana Iron Works. Following are the general dimensions of the new dock: Length of main box, 280 ft.; width of main box, 88 ft. 2 in.; length of each outrigger outside of main box, 40 ft.; total length of dock at keel track, 360 ft.; height of main box at center, 11 ft. 4 in.; height of main box at sides, 10 ft. 1 in.; height from bottom to top of keel track, 11 ft. 10 in.; height from bottom to top of keel blocks, 14 ft., height from bottom to top of air boxes or wings, 36 ft. 11 in.; width between wings at top, 70 ft.; capacity of dock, 5,600 tons; tonnage, weight of dock ready for operation, 2,232 tons. The dock is finely constructed, being made of steel frames and air boxes or wings with 4 in. pine deck, 4 in. pine bottom and 6 in. pine sides. There are eighteen watertight compartments, each provided with a flood gate. There is one steel center bulkhead, 9 ft. 6 in. high, and two intermediate bulkheads and two wing bulkheads. There are thirty-six pumps, 14 in. square by 22 in. stroke, of the box type, and one horizontal steam engine, 18x26 in. Steam is supplied by a 4-in. steam pipe from one 125 H.P. upright boiler placed on shore. The dock is lighted with electric light and work can be prosecuted at night as well as day.

The large vessels now building at the works of the Eastern Ship Building Co., New London, Conn., for the Great Northern Steamship Co., are to be equipped with very complete steam and electric laundry plants, they being the first merchant vessels ever equipped with a plant of this kind for use in general service. These laundry plants are being manufactured by the Empire Laundry Machinery Co. of Boston. Each ship is equipped with two large metallic cast iron and brass washing machines, extractors, mangles, starch kettles, Tyler ironers, electric irons, soap tanks, truck tubs, wash tray sets, ironing boards, starching and ironing tables and large dry rooms. The installation will be first-class in every respect.

The Grand Trunk railway is building a new grain elevator at Portland, Me., to supplement the one in use there. The capacity of the new house will be 1,500,000 bushels and it will be 300 ft. long, 100 ft. wide and 178 ft. high.

ENGLISH HISTORY OF THE GREAT LAKES.

Notwithstanding the fact that the following account from Syren & Shipping, London, gives to Marquette a new and added glory as a steel ship building port, the article is interesting as a condensed and intimate display of the history of the lakes. These English journals are surprisingly well informed regarding conditions in this section of the earth:

On the great lakes of North America the ocean tramp steamer from this side of the "big drink" is very seldom in evidence, although she does occasionally find her way thither from salt water, so that the increasing fleets of merchant steamships under the United States flag which grace those inland waters have merely to compete among themselves. Few of the dwellers in our sea-girt isles are aware of the enormous amount of trade carried on by the steamers of the great lakes, together with the huge floating warehouses that are towed from port to port. Sixty years ago small sailing craft served every purpose of lake navigation, owing to the fact that the requirements of commercial relations were not nearly so exacting as they are today. The insignificant depth of the canals then connecting the lakes with each other did not permit of a greater draught than a paltry nine feet. Steamships were slowly but surely coming to the front; but all were of the side-wheel type, and the largest was only of 2,000 tons. Then came the screw propeller, and probably nowhere has the marine engineer and his black squad effected so radical a revolution in the shipping industry as on the great lakes. Improvements in communication by water as also the rapid growth of towns along the virgin shores of the lakes, proceeded pari passu with the gigantic strides made without cessation by the mining and farming interests. Chicago was but the tiniest of tiny hamlets, with about a dozen dwellings almost defying description; yet in three score years and ten, the short span of a human life, its fame for colossal undertakings is noised abroad to the uttermost parts of our planet. Much stranger still, only a decade has passed away since Chicago threw down the gauntlet and entered the lists as a ship building center, and she now competes successfully in steel ship building with Buffalo, Cleveland, Detroit, Marquette,* Port Huron and Toledo. The vessels built on the great lakes during the financial year ended June 30, 1900, aggregated 130,611 tons, being the record year's output in the history of that record-making region, and almost equal to the total tonnage from the lake ship yards added to the United States register during the two years preceding. Of the steel steamships one of the largest is the Malietoa, built in 1899 in an Ohio ship yard and belonging to Cleveland. She has a gross tonnage of 5,229, net 3,921; is 454 ft. long, 50 ft. beam, and 24¼ ft. depth. As a general rule the lake steamer is not exactly a thing of beauty to the nautical eye, inasmuch as she is strictly devised on the most rigid principles of utilitarianism. Engines right aft, pilot-house well forward, two rudimentary pole masts strangers to canvas, and cargo hatches extending nearly the whole length and breadth of the ship, she would simply shock the æsthetic instincts of the old-time lake sailor could he but revisit from the shades the scenes of his former herculean labors in small craft dependent for progress upon the wilful wind. Not infrequently a big fully-laden cargo steamer may be seen, ploughing the waters of the great lakes in straight furrows, with two or three almost equally huge barges towing astern one behind the other. The Amazon of the latter class, misnamed schooners but actually lighters, is 3,599 tones gross, 376 ft. long, 46 ft. broad and 22 ft. deep. She has carried 6,272 tons of ore from Duluth; and 6,076 tons of grain from Chicago on a draught of 16 ft. Moreover, these cargoes of from 6,000 to 7,000 tons of ore in the steamers, and 5,000 to 6,000 tons in the towed barges, are handled with a rapidity and ease which almost defies belief. Timely appropriations by congress have worked wonders for the navigation of the great lakes which are closed by ice, as regards the harbors and connecting canals, every winter, thus necessitating a year's work being done in about eight months. Hence, it follows, that if it were proved to be a profitable venture, the steamers of the great lakes might be utilized in ocean trading for the four months of the year during which they are compelled to remain idly moored in some snug rendezvous. The five great lakes of fresh water, Ontario, Erie, Huron, Michigan and Superior, are from 240 ft. to 600 ft. above mean sea level. Hence, vessels desiring to compete in the ocean carrying trade have to be locked through the several waterways connecting the lakes, and find themselves not only limited in dimensions but also liable to very heavy insurance charges. Naturally enough the ship builders of the great lakes would be glad to overcome the hindrances placed in the way of through communication by circumstances over which they have no control, for the mineral wealth of the region all around their yards is conducive to rapid progress. As a matter of fact, the annual report of the commissioner of navigation, the Hon. Eugene T. Chamberlain, for the financial year ended June 30 last, shows that last year the ship building yards of the great lakes turned out forty steel steamers of 137,312 tons, thus surpassing the steel steam output of the whole United States for any year prior to 1899. In order to surmount the disabilities imposed on the ship building industry by nature, several steamers, too large for the locks, have been constructed in two sections. Each section has then been towed down through the system of canals, and eventually put together in a dry dock at Montreal. Quite a number of years ago small vessels managed to voyage between the great lakes and Europe, and this year there has been quite a serious attempt to found a regular line of American steamers between Chicago and Europe. The result, however, has been scarcely satisfactory from a pecuniary point of view, owing to high insurance rates and little return cargo. Anyway the sanguine promoters of the scheme have gained experience, if nought else, and may yet see their way to making the line an accomplished fact. Were it not for the many locks, the smallness of their dimensions and the enhanced risk, the ship builders of the great lakes would ere now have become serious competitors with those on the Atlantic coast of the United States, and, perhaps, even with those of Europe. As it is, this section of the United States ship building yards are more than competent to supply the tonnage requirements of the great lakes, and this is a fact which should not be lost sight of.

*Marquette is referred to as a ship building port for the reason that it is the principal port of a customs district in which is located one of the large ship yards. There is no ship building in the port of Marquette.

A four-masted schooner, the Francis C. Tunnell, was launched from the yard of Warren Sawyer, Millbridge, Me., last week. The vessel is 217 ft. long, 41 ft. wide and 19 ft. 6 in. deep.

MEASURING THE WORLD'S COMMERCE.

An accurate measurement of the commerce of the principal countries of the world at the present time is afforded by some figures published by the treasury bureau of statistics in the September number of the monthly summary of commerce and finance. The statement is in the form of a table showing the commerce of thirty leading countries of the world during such part of the fiscal year of each of the countries as is available from their latest official reports. Owing to the fact that the fiscal years of the countries differ in their dates of termination, the statement is in some cases for a six months' period, in other cases for eight, and in other cases for eleven or twelve months. In order to furnish a basis for comparison of the volume of the commerce of the various countries the bureau of statistics gives the average monthly import and export during the part of the fiscal year covered in the statement for each of the thirty countries in question. This statement of the average monthly value of the imports and exports of the thirty countries furnishes a fair basis of comparison of the commerce of the countries one with another, and an opportunity to compare the imports with the exports and thus determine whether the excess, or "balance of trade," is on the import or export side.

An examination of the full list of countries shows that in two-thirds of the number the imports exceed the exports, and that in one-third of the number the exports are greater than the imports. The countries which show an excess of exports over imports are: Argentina, Austria-Hungary, Brazil, Chile, British India, Mexico, Roumania, European Russia, the United States, and Urugay. The countries showing an excess of imports over exports are: Belgium, Canada, Cape of Good Hope, China, Cuba, Denmark, Egypt, France, Germany, Greece, Italy, Japan, Netherlands, Norway, the Philippine Islands, Portugal, Spain, Switzerland, Turkey and the United Kingdom. The table which follows shows the average monthly imports and exports of the ten countries in which the exports exceed the imports in that part of the current fiscal year for which figres are now available:

	Average per month during 1901.	
	Imports.	Exports.
United States	$71,830,923	$113,864,852
India, British	21,598,811	31,565,179
Austria-Hungary	28,098,202	30,311,995
Russia, European	22,818,000	27,373,000
Argentina	9,106,347	15,725,763
Brazil	5,098,794	15,051,841
Mexico	5,336,301	6,239,474
Chile	3,909,702	5,100,104
Roumania	3,489,856	4,503,340
Uruguay	2,260,573	3,328,445

The following table shows the average monthly imports and exports of the twenty countries in which the imports exceed the exports in that part of the current fiscal year for which figures are now available:

	Average per month during 1901.	
	Imports.	Exports.
United Kingdom	$207,886,450	$113,205,085
Germany	111,593,666	87,831,833
France	77,535,000	66,226,000
Netherlands	65,922,642	56,790,923
Belgium	34,355,000	28,021,000
Italy	29,671,765	21,797,747
Switzerland	16,744,325	13,127,100
Canada	15,041,265	12,759,063
Spain	13,470,853	10,025,803
Japan	11,254,785	9,597,743
China	13,446,163	9,553,055
Turkey	7,832,000	5,665,000
Egypt	5,735,378	5,701,025
Denmark	8,203,031	5,326,500
Cuba	5,451,713	5,254,530
Cape of Good Hope	7,491,103	4,075,565
Norway	5,931,944	3,549,735
Portugal	5,715,463	2,425,954
Philippine islands	2,516,539	1,903,417
Greece	2,017,292	1,070,712

VESSEL CONSTRUCTION DURING OCTOBER.

The bureau of navigation, treasury department, reports 150 vessels of 45,547 gross tons built in the United States and officially numbered during October as follows:

	WOOD.				STEEL				TOTAL.	
	SAIL.		STEAM.		SAIL.		STEAM.			
	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.	No.	Gross tons.
Atlantic and gulf	84	5,066	29	2,105	1	3,374	1	176	115	10,721
Pacific	4	1,903	5	574	.....	.....	.....	.....	9	2,477
Great lakes	.....	.....	5	208	.....	.....	8	31,510	13	31,718
Western rivers	.....	.....	13	631	.....	.....	.....	.....	13	631
Total	88	6,969	52	3,518	1	3,374	9	31,686	150	45,547

With the exception of the sailing ship William P. Frye of 3,374 gross tons, built by Arthur Sewall & Co., Bath, Me., all the large vessels were built on the great lakes, the list including the Christopher, of 4,260 gross tons, the Chicago of 3,195 gross tons, the Frank T. Heffelfinger of 4,897 gross tons, the Frederick B. Wells of 4,897 gross tons, the Henry Steinbrenner of 4,719 gross tons and the William S. Mack of 3,720 gross tons.

Doubleday, Page & Co. announce that their magazine Country Life in America has found a welcome of unexpected proportions and enthusiasm. The published announcement has led to orders for more than the first edition and of advance subscriptions in unexpected numbers. The first number is a beautiful specimen of magazine work. In its illustrations, in particular, it is superb.

MARINE REVIEW

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The fact that the British government spent last year the great sum of $4,500,000 on technical education is interesting and important. It shows that those who maintain that England is lagging in the commercial race because of a lack of technical education are being listened to. The British taxpayer is paying for science schools. Several years ago certain economists declared that England was losing her trade and ascribed the reason to deficiency in technical education. It did not follow, indeed, that because the economists declared that England was losing her trade that she was actually losing it. There are certain minds which have an alacrity of seeing disaster in everything and the United States is not free from them. But the seekers after education of a highly specialized order carried the day. England is paying the piper at the rate of nearly a million sterling per annum. It was the great advance made by Germany in a commercial sense which startled the economists. If, instead of saying that England was losing her trade they had said Germany was increasing hers, they would have stated the truth. Technical education, we fear, in its strictest sense, has had nothing to do with the result. Germany started into the industrial race two or three years ago at a mad clip and her products flooded the markets of the world. Old plants were enlarged and new plants were founded. Shrewd observers pointed out that there was no justification for the enormous increase in producing capacity. It was also added that it was quite a different matter to enlarge or establish a plant with one's own money or with some one's else. Interest is inexorable. Its demands may be met with ease if consumption continues; but whether consumption continues or ceases they must be met anyhow. Germany has had three years of intoxication on another person's money; but she is now learning sadly the folly of inflation. Not all the technical education in the world will get Germany out of her plight. An industrial position, such as she hoped to gain, is a slow growth, the patient toil of years, digging the foundation with her own dollars and never assuming an advanced position that cannot be held under circumstances no matter how adverse. Coincident and accompanying industrial development must be the widening and extending of the avenues of commerce. It is the harmonious co-operation of these twin sisters—industry and commerce—that has made England so great. The situation is pretty well put by the Vienna correspondent of the London Standard in the following words:

"The fact is, that in Hungary, in Austria, in Germany—indeed, in all countries which have shared in the industrial and economic boom of the last few years, credulity has taken the place of ordinary caution, and people were admitted to places of trust who would formerly have been asked for their credentials. In Hungary, especially, there has been an extraordinary activity. Many of the towns have been almost rebuilt, as well as provided with gas, electric and water works, asphalt pavements, etc. At the same time there was an excessive industrial activity—for instance, in the construction of machinery, Hungarian locomotives being offered for sale in Asia, and Hungarian wagons being actually sold in Africa. Now that the towns find it less easy to obtain credit than when everything was done with foreign money, and the industrial crisis in Europe has spread to the Hungarian machinery and other industries, there is lamentation everywhere. Some 20,000 hands are reported to have been dismissed last week in Buda Pesth alone. What is apprehended is a serious crisis, which, should it really occur, would, in the first place, affect the great banks in Buda Pesth, and then those in Vienna, for the whole fabric of industrial and financial enterprise in Austria-Hungary is founded on credit alone."

This is a situation which cannot be met by all the technical education in the world. We do not mean to decry the value of technical education. Much as we respect it we respect commercial honesty more.

The ship building industry in the United States, exclusive of navy yards, according to a preliminary report of the census bureau, issued this week, had a total invested capital of $76,699,651 in 1900. This is an increase of 181 per cent. since 1890. The value of products, including custom work and repairing, was $73,444,753, an increase of almost 93 per cent. There were 1,083 establishments and 46,121 wage earners with total wages of $24,388,109; miscellaneous expenses, $3,582,257, and cost of materials used $33,031,280.

Orders have been issued at the navy department for the North Atlantic squadron to assemble at Hampton Roads about the end of November and prepare for the usual winter cruise in the gulf of Mexico and the Caribbean sea. The cruise will probably last six months. The fleet will consist of the flagship Kearsarge, the battleships Massachusetts, Indiana, Illinois and Alabama, and several cruisers. A torpedo boat flotilla, which is to be organized for a practice cruise in the West Indies during the winter, may join the squadron and combine with it in joint maneuvers.

TOLEDO HARBOR ON A 20-FT. BASIS.

NO TROUBLE SHOULD EXIST FOR DEEP-LADEN BOATS ON THE ENTIRE TRIP FROM THE LAKE TO THE HEART OF THE CITY—DESCRIPTION OF IMPROVEMENTS.

Toledo, O., Nov. 6.—A talk with William T. Blunt, assistant United States engineer, who has much to do with harbor improvement work on Lake Erie, under the direction of Major Dan C. Kingman, United States engineer of the Cleveland district, brings out some information regarding Toledo harbor that is of special interest to vessel men. At this harbor a contract is in force with the Lydon & Drews Co. of Chicago, under the continuous contract system, for the completion of the straight channel from the lake to the Wheeling & Lake Erie railroad bridge to a width of 400 ft. and depth of 21 ft. at mean level. This work has been in progress since May, 1900, and has thus far been confined to the deepening of the existing channel for its width of 200 ft. At the present time this deepening has been completed for the entire length of the channel through Maumee bay with the exception of the north half for about one mile outside the crib range. Through this portion the south half, about 100 ft. wide, has the full depth of 21 ft. or more. Four large dredges are at work and the output is from 150,000 to 180,000 cu. yds. per month. Owing to the small price at which the contract was made and the consequent surplus of funds, an excess of depth is being dredged so that notwithstanding the water is now generally about 1½ ft. below mean level, there is an available depth of 21 ft. A possible exception to this is for a short distance about half way from the cribs to the river where the flood in the spring of 1901 caused a slight fill in portions of the channel. Even here there is a depth exceeding 20 ft. and an available depth of 19 ft. at the present stage of water. Deep water exists in each turn-out around the crib range as well as in the balance of the channel, so that deep-laden boats may take either side safely.

In the Maumee river from its mouth through the Wheeling & Lake Erie railroad bridge up to the Craig ship yard, no recent dredging has been done, but the natural channel has a mid depth of greater than 20 ft.; thence to the Hocking Valley wharves the channel has been dredged this year to 21 ft. or more; thence to the Pennsylvania bridge the channel was dredged in 1899 to the depth of about 21 ft.; thence to the Cherry street bridge the natural mid channel depth exists of about 21 ft. or more; thence to the Wabash Lake House the channel dredged in 1895-96 has now a depth of 19 ft. or more and is being redredged to 21 ft. at mean level; thence through the Lake Shore bridge up to Fassett street bridge the natural channel is better than 20 ft. for a width of 400 ft.; thence up the river along the Mitchell & Rowland lumber wharves past the Wabash elevator to Schenck's coal wharf the channel has been dredged to a width of 100 ft. 21 ft. deep.

It is, therefore, evident that Toledo harbor is now placed upon the 20-ft. basis along with other harbors on Lake Erie. No trouble should exist for deep-laden boats during the entire trip from the lake to the Cherry street bridge, the only place requiring special mention being in the straight channel just outside the cribs where vessels should keep a little south of the axis in order to take the deep water. By Nov. 25 this portion will have the full width of 200 ft.

The new lighthouse at the entrance to the straight channel is now under construction, the crib and house foundation being nearly completed. Its location is 3,600 ft. outside the can buoys in 21 ft. of water and 400 ft. northwest of the channel axis.

The rules for the navigation of the straight channel issued by the secretary of war are being generally complied with. The main points of these rules are the limit of speed to 10 miles per hour (which allows 20 minutes for passage from the cans to the crib and 26½ minutes from the cribs to the river, 46½ minutes for the entire length), and the limit of the length of tow line to 200 ft.

In July, 1901, the steamer Helena, drawing 17 ft., struck some obstruction about 7 miles nearly east of Monroe lighthouse in 31 ft. of water. This was the same general locality as that in which the steamer Ravenscraig struck in 1900. At the time the Ravenscraig struck a short examination was made by soundings to determine if any sign of shoal water existed, but no further examination was made to determine the existence of anything else. When the Helena struck this year, the captain's report of bearings and distance from the straight channel entrance was given with considerable confidence as N. E. ½ N. 13 miles, Detroit river light bearing N. by E. about 7 miles, and Monroe lighthouse a little S. of W. about 7 miles. Under authority of the chief of engineers and the immediate direction of Major Dan C. Kingman, a thorough examination was made of this locality during September. An area practically one mile square was thoroughly swept by weighted line carried from two rowboats, and an additional area of nearly 10,000,000 sq. ft. was swept by a line carried from two steamboats. On this entire area of approximately 37,000,000 sq. ft. the only obstructions found were snags, logs, etc., lying on the bottom, and at one place what appeared to be a portion of a solid wreck imbedded in the bottom. This, however, had 25 ft. clear water over its top and could not have been the one met by the two steamboats mentioned. As the area swept extended half a mile or more in each direction from the locality named, it is evident that the description of location must have been in error. The search has been discontinued, as further search upon the data given might be indefinitely continued without results. The location is outside the ordinary path of steamers, being at least one mile east of the direct course from the can buoys to Bar point lighthouse.

At Huron harbor, work by day labor is in progress constructing new cribs for the repair of the west pier. One crib 120 ft. long, 20 ft. wide, with projecting apron on its bottom 4 ft. on each side, was built on shore 14 ft. high and was successfully launched at Huron Oct. 30. This is believed to be the largest crib of its character and shape which has been built up before launching. Its weight was about 250 tons and the launch was in every way successful. Another similar crib will be built this winter and the two will be placed as early in the spring as is practicable, to replace the portion of the west pier which is most badly decayed.

The Globe Navigation Co., Seattle, Wash., at a meeting at Syracuse, N. Y., on Oct. 19 voted to build three vessels for use on the Pacific in addition to two now under construction.

AROUND THE GREAT LAKES.

Capt. Lansing H. Beach, U. S. A., has succeeded Lieut. Col. T. H. Handbury as engineer of the eleventh lighthouse district. Detroit is the headquarters of the eleventh district.

At Buffalo the record for a month's hard coal shipments was broken in October, when 524,838 tons were moved forward. The best previous record was in August, 1899, when shipments were 438,000 tons.

The Red Cliff Lumber Co. of Duluth has purchased from the insurance companies the burned hull of the steamer Fedora, which was beached while on fire during a trip into Ashland and burned to the water's edge.

It is announced from West Bay City, Mich., that Capt James Davidson, who is about the only builder of wooden vessels now left on the lakes, will soon put down keels for two large wooden tow barges, to be completed about May of next year.

Among estimates submitted by the United States lighthouse board for improvements of the service in the lake region are the following: Depot for ninth district, Lake Michigan, $50,000; new light and fog signals station at Point Aux Barques, $32,000; completing tender for inspection of ninth district, $30,000; completing tender Hyacinth for engineer of ninth district, $65,000; Rock of Ages light and fog signal station, $25,000; new light vessel on Martin's reef, Lake Huron, $35,000; repairs to Spectacle reef light, Lake Huron, $54,000.

Several of the big steamers turned out of lake ship yards recently are classed in November supplement of Inland Lloyds register. The list includes the Chicago, owned by the Western Transit Co., Buffalo, and valued at $240,000; Christopher, Milwaukee Tug Boat Line, $235,000; F. T. Heffelfinger, Peavey Steamship Co., Duluth, $270,000; Hugamo, Morley and others, Detroit, $180,000; Wm. S. Mack, Mrs. Wm. S. Mack, Cleveland, $205,000; Henry Steinbrenner, Henry Steinbrenner and others, Cleveland, $260,000; F. B. Wells, Peavey Steamship Co., Duluth, $270,000.

The Donnelly Salvage & Wrecking Co. of Kingston, Ont., is credited with another wrecking job that proved highly satisfactory to everybody concerned. The iron sidewheel steamer Richelieu, under charter to the Lake Ontario & Bay of Quinte Steamboat Co., while bound from Pictou to Kingston, sank in crossing the lower gap west of Kingston harbor, in 65 ft. of water. The spot is much exposed to sea from the lake, but the wreckers, under direction of Capt. John Donnelly, landed her in dock within thirteen days after the first chain was attached, although they were delayed during the greater part of eight days by wind and sea. There was no insurance on either vessel or cargo.

CANAL BOATS GOING TO THE PHILIPPINES.

Regarding the announcement that the four steam canal boats and fifteen tow barges which have been plying between New York and Cleveland via the Erie canal and Lake Erie, are to be withdrawn, cut up and shipped to the Philippines, the general manager of the Cleveland Steam Canal Boat Co., Charles E. Wheeler, says:

"Grain rates have got down to such a low basis that there is no profit whatever in eastbound tonnage. This may be appreciated when I say that the highest rate we have had from Cleveland to New York has been 6 cents per 100. We have not lost money, but this has been due entirely to the westbound tonnage, which has been of a profitable kind, but is not open to other lines than the Cleveland Steam Canal Boat Co., which has enjoyed exceptional terminal facilities at Cleveland, owning warehouses there in which could be stored from 15,000 to 20,000 barrels of sugar and from there forwarded to western points as ordered by the owners. Notwithstanding the improvements made to the Erie canal by the expenditure of $9,000,000, it has not resulted in one solitary cent for any of the lines traversing the canal. There has been trouble from low water, and the eel grass has never been thicker than this year, boats coming to Cleveland absolutely green from it after buffeting the waves of Lake Erie for 176 miles. Beside this, no changes were made in the aqueducts, so that the greatest depth to which boats could be loaded has been 6 ft., precisely the same as before the so-called improvements were made."

Concerning the Philippines company, it is said that at the present time lighterage facilities in the Philippines are exceedingly primitive. The new company is arranging to handle the hemp business.

NEW ISTHMIAN CANAL TREATY IS SATISFACTORY.

Lord Pauncefote, British ambassador in Washington, having returned from his summer vacation with a copy of the newly negotiated Isthmian canal treaty in his pocket, everybody in Washington is talking about this interesting and important document. It is generally understood that the negotiations which took place in London between Lord Salisbury, Lord Pauncefote and the American ambassador, Joseph H. Choate, will now be resumed directly with the secretary of state, in order that the treaty may be perfected and put in readiness for submission to the senate. As a matter of fact little remains to be done except to engross the document in treaty form ready for signature. The government has known for many weeks exactly and precisely the points that were agreed upon in London, President Roosevelt and Secretary Hay have long ago decided that the terms are entirely satisfactory to them and are of the opinion that they will be equally acceptable to the senate. Several weeks ago Secretary Hay permitted the fact to become known officially that the treaty as negotiated contained everything that the senate said last winter should be included in it, and that it did not contain those things that the senate objected to. The important new features of the treaty are:

First—The declaration that it supersedes and takes the place of the Clayton-Bulwer treaty, which it formally abrogates.

Second—The provision that the United States is to guarantee at all times the absolute neutrality of the canal.

Third—That whatever language the treaty contains which might be construed as preventing the United States from fortifying the canal, is eliminated.

It has always been claimed by the representatives of the administration that the treaty as originally negotiated, guaranteed to the United States every possible power and privilege that could have been wished for and everything that was demanded by this government when the treaty was being framed. The willingness of Great Britain to grant all that was asked by the United States has been certified to a thousand times by the officials of the state department, who now say that the changes outlined above have been made in order to make the convention acceptable to the United States senate and that they also were granted freely and willingly by the British government. It is the opinion of those members of the administration who have had a part in negotiating the new treaty, that what England has now granted is a mere amplification of words to meet the "far fetched" criticism of the senate, and they are still of the opinion that the United States had all rights possible under the original treaty. But the language of the new one is so specific and positive as to leave no room for doubt.

It is authoritatively stated that the original treaty before being sent to the senate was submitted by the president to each member of his cabinet, who heartily approved it, and that it was also carefully scanned by "every international lawyer in this country whose opinion on such a subject was worth having." Yet the senate was not satisfied and rejected the state department's work as the evidence of a very one-sided bargain in which the United States was not the favored party. Now the statement is made on the same authority that England has granted the changes suggested by the senate's criticism with the same willingness that she gave the United States government what it asked in the first place, and that there is not now a "jingo" in the senate who will be able to conjure up a pretext for finding fault with the treaty.

MORE MEN NEEDED FOR THE NAVY.

A meeting of the members of the Ohio naval reserves, yachtsmen sailors, naval veterans of the Spanish-American war and all interested will be held at the Gatling Gun armory, Cleveland, on the evening of Nov. 13, to stimulate interest in securing recruits to the navy and of urging upon congress the establishment of a naval militia of national scope. Such an organization would include all state naval reserves now in existence and yachtsmen and sailors. There is great necessity in the navy for trained seamen and the present movement is to supply the deficiency if possible. Time and again secretaries of the navy have called attention to the need of suitable men. All who are interested are urged to be present at the forthcoming meeting. Secretary Long recently sent the following letter to Gov. Nash of Ohio upon the subject:

"The navy department believes it desirable to form a national naval reserve, and with this end in view has a proposition to make, in case the measure should be adopted by congress and meet the approval of the president. The complete details of the project have not been definitely formulated. In general it contemplates the following provisions:

"Enrollment of officers and men from naval militia, the merchant marine, yacht squadrons, and from those connected with a seafaring life. Compensation will be based upon pay of corresponding grades and rates in naval service, with traveling expenses to and from home to the vessels to which they may be ordered for annual tour of drill and instruction. Officers of naval reserve commanding merchant vessels to be permitted, under certain rules, to fly a special flag. Pending legislative action the department desires to ascertain the number of men who would be likely to consent to enrollment, together with the positions they would probably be able to fill. But no steps toward actual enrollment can be taken until after legislative action and the president's approval. With this end in view the department invites the commanding officers of the naval militia of your state, through you, to furnish it with lists of men of their reorganization, or any others outside of it, who may be considered suitable for enrollment in the national reserve, and who will probably consent to become members of such reserve, together with the grade or rating in which each would be willing to serve.

"One requisite for the reserve would be either service during the Spanish-American war, three years' service in a naval militia organization, or a reasonable service afloat in merchant or other vessels."

GLOBE NAVIGATION CO.

Mr. J. W. Clise, president of the Seattle chamber of commerce and managing director of the Globe Navigation Co. of Seattle, has just returned to the Pacific coast after a hurried trip through the east. Mr. Clise visited Cleveland for the purpose of arranging certain matters pertaining to the steamer Meteor and other steel vessels purchased from the Messrs. Hawgood through Capt. W. W. Brown of Cleveland and which were recently delivered at Seattle. He is deeply interested in the question of subsidies for American shipping and legislation by congress which shall develop this important branch of industry. In speaking of his company, Mr. Clise said:

"The Globe Navigation Co. was formed early in the present year to do a general business in American bottoms. Three of our steamers are at Seattle. These and others to be built will be the product of American ship yards. The vessels we now have range between 3,000 and 3,500 tons and represent the best workmanship and appointments extant. Later on the company intends building larger steamers. A fleet of sailing vessels is under construction and these, too, will be American production from stem to stern."

Mr. Clise explained that the Globe company would operate its vessels over a wide area. Steamers will be dispatched from Seattle around Cape Horn to Norfolk, Baltimore and probably other Atlantic ports. Other ships will engage in the Alaskan trade for which Seattle is so favorably situated, and others will call at Honolulu and eventually the Philippines. "The capital and enterprise represented in the Globe Navigation Co." he said, " is in the undertaking largely because we have faith that the American people are not going to stand still much longer and let foreigners do their vast carrying trade. It is incomprehensible that at a time when the United States is making such strides to capture the markets of the world this great country should lag behind other nations in its duty to the domestic shipping industry. If we are to do our immense export business in American bottoms, congress must establish a reasonable system of subsidies and extend our coast-wise regulations until they embrace every foot of American territory, however distant it may be. The coast-wise regulations are about to be applied to Hawaii, but in order to promote American shipping the Philippines should also be included. The sentiment on the Pacific coast is strongly in favor of legislation calculated to build up the merchant marine, and we shall look to our representatives in both branches of congress to further our desires in this respect. As I have already said, the Globe Navigation Co. has gone ahead in its costly venture in the belief that the time is at hand when the American people will insist that its shipping interests be fostered in the manner which has made England what she is on the sea today. We cannot believe this country will go on forever paying millions to foreigners when the money might just as well stay at home by patronizing domestic shipping."

THE EMPIRE OF THE NORTH.

IT IS GRAPHICALLY POINTED OUT THAT THE DEVELOPMENT OF THE FUTURE IS THE COUNTRY LYING NORTHWEST OF THE GREAT LAKES.

Some men are gifted with prophetic vision and are thereby capable of seeing into the future a little further than the rest of us. A little band of men have already perceived that the great theater of action in the future is the Canadian Northwest. An empire is gradually unfolding there before our eyes. The Hon. John Charlton, M. P., member of the Anglo-American joint high commission, is one of the men who recognizes the opportunities of this vast stretch of land, so rich, so productive and yet so little known. To the popular imagination this immense territory is an ice-locked tract, the home of the blizzard. Nothing could be further from the truth. Its climate is temperate. Well-watered it is par excellence the greatest cereal producing country in the world. The world will eventually look to it for the greater part of its wheat supply. It is interesting to speculate upon the influence which the exploitation of the natural resources of this region will have upon other sections of the country. Undoubtedly from the standpoint of transportation it will greatly add to the commerce of the great lakes. The great lakes afford the cheapest and most commodious avenue of reaching the eastern market—the place where population must ever be the densest. Moreover, it is reasonable to suppose that the geological formation which has deposited such immense quantities if iron ore in Michigan and Minnesota crops out again somewhere in this vast territory. It would have to be discovered in a very remote zone to prevent its natural outlet being the great lakes. There is no likelihood that the steel-making center of the United States will be shifted from its present base. All the elements conspire to make the territory contiguous to the south shore of Lake Erie the logical place for the manufacture of steel. We venture the prediction that the carrying trade of the great lakes is still in its infancy, notwithstanding the fact that the development of the past seven years has been sufficient to forestall even one's imagination. Mr. Charlton's article, which has called forth this comment, is as follows:

"The Canadian northwest is to become, in the near future, the center of Canadian population and material progress. Thirty years ago, when this vast region was annexed to the then lately formed Dominion, at the cost of $1,500,000, paid to the Hudson Bay Co., and the reservation of two sections of land for that company in each township, for which their title to the vast region then known as Rupert's Land was surrendered, very little was known as to its nature or its character. At a later period explorations demonstrated the existence of certain unexpected conditions. It was found that to the westward of Lake Superior the isothermal line curved sharply to the northwest, and that the yearly mean temperature was but a trifle lower in the valley of Peace river, in lat. 56°, than it was at Winnipeg. In the year 1888 a special committee of the Canadian senate entered into a thorough examination of the available evidence bearing upon the question of the agricultural, mineral and timber resources of that portion of this great north land, lying north of the Saskatchewan watershed, east of the Rocky mountains and west of the Hudson bay. Before this committee was summoned, Hudson bay factors from as far north as Great Bear lake, missionaries, travelers, voyagers, trappers, members of geological survey parties, who had traversed portions of this great region, botanists and naturalists. From these various sources of information a mass of evidence was derived, which was deemed to warrant the committee in arriving at the conclusion that the region north of the Saskatchewan watershed, and drained by the Athabasca, Peace river, Laird river, Slave river and portions of the Hay river valley and the Mackenzie valley, possessed soil and climatic conditions that gave it adaptability for settlement and cultivation. The estimate formed by this committee was, that in the great region north of the Saskatchewan watershed, west of Hudson bay and east of the Rocky mountains, there were 300,000 square miles of land adapted to the growth of wheat, 407,000 square miles, including the wheat area, adapted to the growth of barley and oats, 656,000 square miles, including the wheat and barley area, adapted to the growth of potatoes and turnips, and 860,000 square miles of good pasturage lands. This immense region contained great stretches of prairie land and extensive forests of spruce, poplar, balm of gilead and banskian pine.

"South of the region covered by the investigations of this committee lies the province of Manitoba, the territory of Assinaboia, over one-half of the territory of Alberta, and two-fifths of the territory of Saskatchewan, with a total area, south of the north watershed of the Saskatchewan, roughly placed at 270,000 square miles. This region is within the wheat-growing belt, and gives, with the areas suitable for the cultivation of cereals, north of the Saskatchewan watershed, a total in the Canadian northwest of 570,000 square miles adapted to the growth of wheat, and of 780,000 square miles adapted to the growth of barley and oats. Stated in acres, this would give a wheat area of 360,000,000 acres, and it is believed that 250,000,000 acres of wheat lands in this region is a safe calculation.

"A bare commencement only has been made towards bringing the wheat lands of the Canadian northwest under cultivation. Possibly one-eightieth part of the lands well adapted to the growth of wheat has been brought under the plow, and yet the export of wheat, mostly No. 1 hard, will reach 30,000,000 or 40,000,000 bu. this year. As settlement extends northward, it is found that the rigor of the climate does not increase. At Prince Albert, on the lower Saskatchewan, 300 miles north of the latitude of Winnipeg, the wheat crop is less liable to injury from frost than in Southern Manitoba, and the yield is heavier. In the Edmonton region, on the North Saskatchewan, oats are said to yield 100 bu. to the acre, weighing 40 lbs. to the bushel. The extensive Buffalo grass region, extending along the eastern base of the Rocky mountains, from the boundary line to the North Saskatchewan, is the finest ranching country in America. This great northwest region is rich in coal, gold, silver, copper, iron and petroleum, and the great forests north of the Saskatchewan will be of immense value in the future. The upper Yukon valley, within the bounds of Canada, has extensive pasture areas, and is one of the most productive gold fields in the world.

"The great lakes in the northerly part of the Canadian northwest, Athabasca, Great Slave lake, Great Bear lake and numerous smaller bodies of water swarm with whitefish and trout, and the time is coming when their great piscatorial wealth will be utilized. Hudson bay is a great salt water sea covering over 350,000 square miles, and entirely within the limits of Canada. Its extreme length, including Chesterfield inlet, its northwest arm, and James bay, its southern extension, is 1,100 miles, and its greatest width is 600 miles. Into this great body of water numerous salmon streams enter from the east, and it possesses prolific cod banks, and seal, walrus and whale fisheries. It is believed that its fisheries will exceed in value those of the North sea, which is much inferior in expanse to this great mare clausum. On the east side of Hudson bay immense deposits of iron ore, conveniently situated for shipment, have recently been discovered. Hudson bay connects with the Atlantic ocean by Hudson strait, which is 100 miles wide. Through this passage sailing vessels have found access to its waters for the last 300 years. Henry Hudson entered it in 1610, when searching for the Northwest passage, and was put adrift on its waters by his mutinous crew. Explorations have been made in recent years for the purpose of fixing the value of this route as a commercial outlet, and it is believed that navigation can be maintained for four or five months in the year. The vast advantage to the Canadian northwest of a direct route to Europe, via Hudson bay and Hudson strait, will be obvious, from a glance at the map. The valleys of the Peace, the Athabasca and the Saskatchewan rivers would find this their shortest and cheapest route to Europe. From the head of navigation upon Chesterfield inlet to a navigable tributary of Great Slave lake, it is reported that a connection could be made with less than 150 miles of railway. This would give connection with over 7,000 miles of lake and river navigation if the rapids of Slave river, between Athabasca and Great Slave lakes, 20 miles in length, were improved by canals and locks. If this were done an unbroken stretch of navigation on the Athabasca and Peace rivers and the great expanse of Athabasca lake would be secured down the mighty Mackenzie river to the Arctic ocean. From near the mouth of the Mackenzie a railway, 50 miles long, would connect with the Porcupine, a navigable tributary of the Yukon. From the easterly end of Lake Athabasca, which receives the waters of Athabasca and Peace rivers and other navigable streams, a railway, 440 miles long, would connect with the waters of Hudson bay, at the excellent harbor of Fort Churchill.

"The northern continental slope is from the head waters of the Mississippi and of the Missouri to the Arctic ocean. No traverse mountain ranges impede the free course of the warm currents of air from the Mississippi valley northward, and in spring and summer the prevalent winds are from the southwest. The Japan current on the west coast of America also exerts an influence upon the temperature of the northwesterly portion of this great region. The Chinook winds from the southwest render the continuance of snow in the region on the eastern side of the Rocky mountains quite uncertain in the winter for a long distance northward from the boundary line, and the branch of the Japan current entering the Arctic ocean, through Bering straits, exerts a considerable influence upon the climate of the southern shore of the Arctic ocean, as far east as the mouth of the Mackenzie river.

"The great region west of Hudson bay east of the Rocky mountains, and north of the boundary line, consisting of the Province of Manitoba and the territories of Keewatin, Assinaboia, Alberta, Saskatchewan, Athabasca, Mackenzie, Yukon and Franklin, contains over 2,000,000 square miles. The portion of this region adapted to the growth of wheat, consisting of 250,000,000 acres, equals 1,563,000 farms of 160 acres each. The present year's surplus of 30,000,000 or 40,000,000 bu. for export can easily be increased twenty fold, after supplying domestic wants. But a little more than 2,000,000 acres were in crop this year. This region can support a population of 50,000,000. If the navigation of Hudson strait proves to be practicable, its products can reach the markets of Europe as cheaply as those of Iowa, Kansas, Nebraska, Dakota and Minnesota, and, in connection with railway lines of moderate length, and the navigation of the lakes and rivers of the Mackenzie system, communication with excellent harbors on Hudson bay can be readily and economically made for all the lands of this region adapted to the growth of cereals.

"It is obvious that the Canadian northwest has a great future in store. It offers the only extensive area of virgin soil for settlement remaining unappropriated in North America. Hitherto immigration into this region has been slow. The tide is now on the turn. The movement into this region up to the present has been

"'But the first low wash of waves,
Where soon will flow a human sea.'

"Last year 12,000 settlers entered from the United States. This is the vanguard of a great host to follow. The future population of this country will possess vitality and hardihood, perseverance and courage. It will also possess free institutions and good laws. The steadiness and stability of the British social and political structure will be reproduced and improved upon. The religious wants of this country will be cared for, and its population will not be allowed to drift away from wholesome religious influences. Already one of the evangelical church organizations in Canada—the Presbyterian—has 900 mission stations in the northwest. The Methodist, the Episcopalian and the Catholic churches are also fully alive to their duty to this region, and the time approaches when the Great Lone Land will nurture busy communities, and give shelter, home and sustenance to millions of free men."

H. J. Cloran, mayor of Hawkesbury, had a long interview with the Hon. J. Israel Tarte, minister of public works for the Dominion government, last week, when he submitted to the minister a scheme which he claims will insure the absolutely safe navigation of the St. Lawrence river between Montreal and Quebec, by day or night, without pilots, without lighthouses and without buoys. Mr. Cloran has patented his scheme, and the working models are now in the hands of the public works department. In this scheme Mr. Cloran proposes to establish a power house at Montreal in connection with the harbor works. From this power house he proposes to run transmitting cables to the center of the channel. Down the exact center of the channel he would lay a cable from Montreal to Quebec to supply a line of electric lights, either on the water level or at whatever height above the water level should be decided upon. These lights would be fastened by small anchors, so as to remain exactly over the sides of the channel, which would thus be clearly marked out. The lights on the one side would be of one color, and those on the other side of another color.

GROWTH OF THE SAILING VESSEL.

In a special article in the New York Tribune it is recalled that the late Arthur Sewall predicted, shortly before he died, that there would always be business for the sailing ship, since with bulk freight of an imperishable character in which time of delivery was not important the steamship could never compete in cost of carriage. He also added that within five years tonnage could be built as cheaply in the United States as on the Clyde. Mr. Sewall built the first full-rigged steel ship ever constructed in the United States—the Dirago. At the yards of the Fore River Ship & Engine Co., Quincy, Mass., a vessel constructed entirely of steel is now being built which is a striking confirmation of Mr. Sewall's prophecy of the future of the sailing ship. It is a seven-masted steel schooner—the first to be constructed anywhere in the world—and the Review will shortly have the pleasure of publishing an accurate and authentic description of her.

As Mr. Sewall said, the fight for a profitable existence among freight carriers has introduced a larger type of vessel, for the fixed expenses of such a craft do not increase in the same ratio as the size, and so are relatively less than those of a smaller vessel, so that she is able to make a profit on a lower rate of freight than would be possible were less tonnage carried. Experience with the only two six-masters in the world—the two big wooden schooners built in 1900, the George W. Wells, in Camden, Me., and the Eleanor A. Percy, at Bath—was such that it was recognized that a limit had been reached in the length of wooden vessels, so that if schooners were to grow it was necessary to begin in steel. Hence the genesis of the new seven-master, which will be 403 ft. long over all, and 480 ft. from the tip of her bowsprit to the extreme end of her aftermost boom—almost as long, that is, as the two battleships the New Jersey and the Rhode Island, which are building on the same beach. Bowdoin B. Crowninshield, the designer of Lawson's Independence and of other noted craft, laid her lines. Capt. J. G. Crowley, of this city, is at the head of the syndicate which will own her, and his brother, who has commanded the Wells, will be her master.

But the new seven-master is more than a realization of Mr. Sewall's prophecy. As has just been suggested, she marks the climax of the development of the most thoroughly American type of craft, the schooner. The first of this class of vessels was built in Gloucester in the second decade of the eighteenth century. A hundred years later—or down to the war of 1812—schooners of 150 tons were still considered large, and not until the time of the civil war did they run up to 200 and 300 tons. It was on the great lakes, however, where the American spirit had its fullest play and was freest from European traditions, that the first three-masters were built, in 1850; and twenty years later the three-master had become the favorite rig for all schooners running from 150 to 600 tons. In 1880, or soon after, the first four-masted schooner was built, and vessels of schooner rig began to run up to 1,200 and 1,500 tons. For the lake traffic mere barges with five masts, fore and aft rigged, but using their sails simply to aid the towboat, were, properly speaking, the first five-masters, although the schooner Governor Ames, built twelve years ago at Waldoboro, Me., as an experiment, was the first genuine five-masted vessel afloat—the first, that is, that kept the seas of her own power. The Ames, however, remained the only schooner of her class until three years ago, when the John B. Prescott, with a capacity of 4,500 tons, was built at Camden, and her rival, the Nathaniel Palmer, was launched at Bath.

While the seven-master being built at Fore River is an excellent object lesson—if any doubters are left—of the fact that America is constructing steel sailing ships on a practical scale, yet it must be remembered that as far back as 1825 Philadelphians built the iron light draught ship Codorus. In 1880, also in Philadelphia, the experiment of a three-masted iron centerboard schooner was tried, the Josephine, registering 365 tons, with a length on the water line of 126 ft. and a beam of 34 ft., as against a depth of only 12 ft. But she was not a sufficient financial success to warrant others of her class. It was in the same year, by the way, that another experiment was tried, in the building of the William L. White, the first four-masted schooner, at Bath, registering 996 tons, with a length of 205 ft. over all, a beam of 40 ft. and a depth of hold of 17 ft. She was a four-master by accident, for she was originally designed for three masts, but it was decided that they would be too unwieldy, and so the fourth mast was added, thus presaging the increase in the number of canvas carrying sticks.

By no such chance is the Fore River craft to have seven masts, but in accordance with a carefully worked out scientifically planned design. In the first place, she will carry as much cargo as some of the larger ocean liners—between 7,000 and 8,000 tons—while requiring only sixteen men; that is, although she will carry nearly 3,000 tons more than the six-master, she can be handled with only two more men, making her proportionately a much more profitable craft. Moreover, a square rigged ship of the same size would require at least thirty-five men, and probably more, so that, although the seven-master will carry an American crew at a higher cost for a man than a vessel under a foreign flag, she will pay better.

From the bottom of her keel to her main truck the new seven-master will be thoroughly American in conception, design and construction. She will be, so far as known, the first American sailing craft with a double bottom; that is to say, she will have a space of 4½ ft. between her "skin" and the bottom of the hold, but this loss of space will be more than counter-balanced by the advantage in the matter of ballast. When she delivers cargo at one port and wishes to go in ballast to another all that will have to be done will be to open the seacocks and let in twelve hundred tons of water, and upon arrival at the port where cargo is to be taken on board this water can be readily and cheaply pumped out. When it is remembered that ballast costs $1 a ton, and must be put in and taken out of the hold by hand at a considerable additional expense, the saving is apparent. Furthermore, the space lost in the water bottom is more than made up in the reduced size of the keelson. In the six-masters the great wooden truss is 9 ft. wide by 14 ft. high, and takes up a great deal of cargo capacity, while in the Fore River craft the steel keelson is only 18 in. wide by 36 in. high, and yet gives much greater stiffness, for in a seaway the six-masters are "tender"; that is to say, there is a certain flexibility to the ship's backbone which would make it impossible, in the opinion of most experts, to build a larger craft of wood. Until recently the seven-master had existed only in Mr. Crowninshield's plans and in an intricate mass of crisscrossing lines on the floor of the big mould loft at Fore River, but the actual work of construction upon it has been begun, the concrete foundation for the shipway having been laid on the beach, and her keel is now being erected. Plates and angles for her frames are being received from the Carnegie works, and are being pounded and bent into shape by massive machinery in the ship tool shop.

The new seven-master will have a beam of 50 ft. and a depth of hold of 30 ft., drawing 27 ft. of water when loaded. The height of her stern will be no less than 58 ft., or taller than most four-story dwelling houses. She will spread an enormous amount of canvas, 43,000 sq. ft., or over an acre, and can point higher and thus out-foot any square rigger afloat. While a big square rigger might beat her on a steady following wind, on any given voyage she would come in first in a race, because of the ease with which she can beat to windward and on account of the speed she would develop on long reaches. What the future of the schooner will be no man can tell, especially in view of the fact that only a year or two ago it was generally believed that the five-master was to be the limit of efficiency. Although the draught of the bigger modern vessels approaches the limit of our harbors, yet there is no reason for doubting that even longer vessels can be built. So it is possible that the next record breaker will be an eight-master, or that in time we shall see even a nine-master.

VESSELS WANTED FOR THE BEAUMONT OIL TRADE.

Mr. D. G. Gibson of the Six Wells Oil Co. of St. Louis, operating in the Beaumont oil field, has been in the great lakes district during the past three weeks endeavoring to find steamers that may be utilized in the oil trade. In this connection he brings out a most interesting and surprising fact—that there are practically no vessels immediately available for the Beaumont oil trade. After six months of canvassing the Pacific and Atlantic coasts the Texas oil companies have only been able to secure four vessels. Mr. Gibson reports that he only found two on the great lakes which could be converted into tank steamers. As a rule he found the vessel owners averse to equipping their steamers for this trade. They would sell, but they have few ships that are especially desirable. The need of vessels is immediate. The Texas companies do not want to wait to have them built—hence the desire of the Beaumont companies to enlist the interest of owners of existing vessels. Mr. Gibson says that any carrier who will enter the Texas oil trade can get most favorable and profitable charters. There are enormous quantities of oil awaiting shipment to coastwise and foreign ports. As a side issue of a somewhat singular nature Mr. Gibson reports that the book "Steel Ships" by Thomas Walton is popular among the oil companies owing to its exhaustive chapter upon the methods of building tank steamers or the conversion of cargo steamers into tank steamers

The steamer Paraguay, purchased some time ago from lake owners for the Texas trade, has been converted into a tanker at the Lorain works of the American Ship Building Co. and will be ready about Saturday of this week to undertake the passage to the seaboard through the Canadian canals. The Paraguay will undoubtedly make a serviceable ship in the oil trade, as she is of about 3,000 tons freight capacity and is a new steel vessel. Edward Gaskin of Buffalo represented the oil interests in the work of refitting this vessel for the new service in which she is to be engaged.

D. E. Ford, who is well known to lake ship builders, has also been on the lakes for the past week looking for vessels that might be converted into tankers. It is supposed that he represents the Standard Oil Co. on account of his connection with Standard interests in the past. It is rather late now to make any changes in vessels that might be purchased and still get them through the canals before the close of navigation.

Mr. Ford has purchased, very probably for the Standard, the steel tow barges Loyalty and Liberty and they will both be started for the Atlantic coast during the present week. It is understood that Mr. Ford is also figuring on the purchase of some of the whaleback vessels owned by the United States Steel Corporation. The steamers Paraguay and Asuncion and the tow barges Loyalty and Liberty, all of Canadian canal dimensions, were built something more than a year ago for the International Steamship Co., in which Mr. A. B. Wolvin of Duluth is the leading spirit. The Asuncion went to the Pacific coast several months ago, and as noted above the Paraguay has been sold to one of the Texas oil companies. Now the barges, Loyalty and Liberty, go to the Standard Oil Co., and the International company has probably profited by its investment, although the vessels were not regarded as very good property from an earning standpoint a short time ago.

WORK AT ROACH'S SHIP YARD, CHESTER, PA.

There are at present no hand-riveters working in Roach's Ship Yard, Chester, Pa., all the work being done with pneumatic tools. When the riveters struck six months ago Mr. Roach immediately installed additional machine riveters with the result that all of the work on the three barges for the Panama railroad was done by the machines. The work has been so satisfactory both as regards quality and cost, that machine riveting will now be a permanent thing in the ship yard. The strikers now refuse to return to work unless the machines are dispensed with, and while some hand-riveters could be used to satisfaction and work is offered them, orders have been placed for a number of additional machines to do the work in case the riveters still refuse to return. The uncertainty of the situation has been a bad thing for work in the ship yard, as a number of contracts have been lost by the refusal of the firm to bid while the strike has lasted.

A large force of men are working on alterations and repairs to the steamship Grande Duchesse, which is being refitted for service on the Savannah line. The joiner work is being entirely changed and workmen from every department of the ship yard are finding work on this ship. The frames are being rapidly erected for the Chester Shipping Co.'s steamer Chester and the work of plating her will soon be well in progress. It will not take long to rush this fine little vessel through and get her ready for service on the route to Philadelphia.

The big steamship City of Memphis, for the Savannah line, is moving along toward being fully plated. Her engine is practically completed and will be ready long before the hull is ready to receive it. In the machine shop the work of facing up the large steel castings for the stern posts of the two Pacific liners under way at the Eastern Ship Building Co.'s works, New London, Conn., is being done. The castings are being made at the Seaboard foundry, and the finishing is being done at the Roach works. The castings are the largest ever made for ship construction.

REVIEW OF THE COBRA DISASTER.

WHAT MANNER OF VESSEL SHE WAS AND WHEREIN HER STRUCTURAL WEAKNESS LAY—SHOULD HAVE BEEN USED FOR EXPERIMENTAL PURPOSES ONLY.

From the Engineer, London.

The judgment of the Cobra court martial has been everywhere received with entire approval, and, indeed, in view of the evidence which was presented for its consideration, no other decision could have been expected. All attempts to explain the disaster by suggestions of submerged wrecks or careless navigation were utterly futile, and very properly so. The whole tenor of the evidence went to show that the Cobra was inherently a weak vessel, and that she should never have been sent to sea except in fine weather. The circumstances of this latest naval disaster are such as to deserve the closest examination, if only for the sake of preventing further loss of valuable lives and national property through similar causes in the future. The Cobra was a steel torpedo boat destroyer, built in the year 1899 at Elswick-on-Tyne, by the well-known and justly eminent firm of Sir William Armstrong, Whitworth & Co. She was not ordered by the admiralty, but was essentially what is known as a "spec" vessel, that is to say, one built upon the expectation that a purchaser would be found for her when completed. Such a transaction is very common at mercantile ship yards when sufficient orders to fill the building berths have not been booked; and in such cases only such a type of vessel is laid down as will be certain to tempt a purchaser. Torpedo boat destroyers have been before, and are still, built at other ship yards in this country under similar conditions. The design is in such cases the work of the ship builder, who usually takes care to ensure that it will receive the approval of the contemplated purchaser, by more or less closely following the plans upon which other vessels of the type have already been built and accepted. The case of the Cobra was, however, singular in regard to some very important particulars. The Parsons Turbine Engine Co. of Wallsend-on-Tyne had already shown that the type of marine engine designed by it was eminently suited for the attainment of very high speeds, and that it had the further advantage of not communicating too much vibratory movement to the hull of the vessel, as in the case of ordinary machinery having reciprocating motion. It is further claimed that higher efficiency and greater fuel economy are associated with the Parsons machinery than with that ordinarily fitted in these destroyers. To prove these qualities and bring the system into prominent notice, it was arranged by the Turbine company to fit its machinery into two of these vessels, one of which was to be built by Hawthorne, Leslie & Co., at Hebburn-on-Tyne, and the other by Armstrong, Whitworth & Co. at Elswick. The Hawthorne destroyer was named Viper, and the Elswick vessel was named Cobra.

Now it would appear that these two vessels were designed and built wholly independently of each other, each being to its own builder's design and plans. The Viper was the first to be completed, and offered to the admiralty for purchase, and after undergoing very exhaustive trials she was taken over by the government, and added to the royal navy. In the reports of her performances which were published at the time it was stated that her machinery developed no less than 10,000 H.P., and that her speed on trial was 35.9 knots. Let us now see what sort of a vessel this Viper really was, for, as is doubtless now well known, she was wrecked near the Channel islands during the recent naval maneuvers. The Viper was 210 ft. long, 21 ft. broad, and 12½ ft. deep; her displacement at the normal draught of water being 370 tons. It is said of her that upon one occasion, at least, her machinery indicated 12,000 H.P., and that in three hours' continuous steaming she averaged 36.8 knots, her turbine engines making no less than 1,180 revolutions per minute. The machinery which developed this enormous power was placed in a vessel of which the shell plating amidships was only about 3-20 in. in thickness, with about 4-20 in. sheerstrakes and garboards, and her flat keel plate was less than ¼ in. thick, while the plating at the extremities of the vessel was about 30 per cent. less in thickness than that at amidships. The frames, which were 21 in. apart, ranged from 2½ in. by 1½ in. by about 7-40 of an inch, to 1¾ in. by 1⅜ in. by about the same thickness, while the reverse frames were proportionately smaller both at amidships and at the ends of the vessel, and the thickest floor plates only callipered ⅛ of an inch. To find machinery working up to from 10,000 to 12,000 I.H.P. in a structure so light as this leads to the presumption that the limit of endurance of the steel material, if not already exceeded, could not be very far off. And yet it seems the Viper was looked upon as a perfectly safe and suitable vessel for the work she was intended to perform, and it would appear that she showed herself to be so up to the time she ran upon the rocks which wrecked her. That her factor of safety was much smaller than is considered necessary in ordinary vessels, whether for war or mercantile purposes, goes without saying; but this condition applies to all vessels of the destroyer type, and may perhaps be considered an unavoidable element in the design. If such powerful machinery is placed in a vessel of her dimensions, draught of water and form, there cannot be much of the 370 tons displacement available for carrying the materials composing the hull. As nothing was adduced at the court martial to show that the Viper was not such a vessel as should have been acquired by the admiralty for the service of the royal navy, it must be assumed that her builders were justified in the design they prepared, and that both Messrs. Parsons and Hawthorne, Leslie & Co., deserve the congratulations of the nation upon having contributed such a marvellous craft to the nation's marine defences. At all events, when she had been built and tried in the North sea upon many occasions, and found to realize successfully such extraordinary speed results, their lordships had to consider that if they did not purchase her some other power undoubtedly would. And so the Viper was taken over by the admiralty and put into commission for sea service. That she was wrecked when run upon rocks in no way detracted from the confidence which had been placed in her seaworthiness, for vessels are not built for striking rocks, but for safe navigation in deep water.

The Cobra was not completed until after the Viper had made her speed trials. When ready for sea, and after her engines had been tried, she was offered for sale to the admiralty, who sent one of their experienced shipwright officials to examine and report upon her. This gentleman found that the Cobra was certainly not a duplicate of the Viper. The Elswick company is not given to copying other people's designs, but possesses a staff fully competent to do its own designing on its own premises. Whether or not it was aware of the dimensions and scantlings of the Viper has not been stated, but as such matters are not easily kept secret upon a river like the Tyne, where the men working at one yard are often in the company of those working at other yards in the neighborhood. there can be little doubt that the Elswick company knew as much about the Hawthorne boat as it desired to know. It does not involve a great stretch of the imagination to suppose that it not only knew the details of the Viper, but that it also determined "to go one better." Whether that be so or not, it fixed the Cobra's dimension at 223 ft. long by 20½ ft. broad and 13½ ft. deep. These dimensions gave a vessel of about the same proportions of depth to length, but with a greater displacement, and this displacement was doubtless utilized in carrying more powerful machinery and a larger coal supply. But the principal fact to be borne in mind was that the weights carried being relatively in excess of those in the Viper, there was not so large a fraction of the displacement available for structural materials. It is said, but we do not know with what truth, that the scantlings were less than those in the Viper, while the structural arrangements, especially at the upper and lower parts of the hull, were not so conducive to strength in the longer as they were in the shorter vessel. Whatever the actual differences were, the surveying officer discovered them, and duly reported them to his superiors at Whitehall. These latter very properly insisted upon additional strength being given to the hull, so as to bring the Cobra more into line in this particular with existing destroyers, which had been found to be—or, or at least, were thought to be—strong enough. It is quite clear from the evidence on this point that none of the admiralty officials mixed up in the case thought the hulls of the existing destroyers had too large a factor of safety.

Suggestions were made as regards the additions which would be considered sufficient; but as the Cobra was already a completed vessel, with engines and boilers in place, it was found to be impossible to do very much in the way of strengthening her without pulling the vessel to pieces. Under these circumstances there can now be no doubt that, in the light of the distressing events which were made known at the court martial, the professional advisers of the admiralty should there and then have declined to recommend her purchase, save for experimental purposes. But this they did not do, and probably for the same reason that the ill-fated captain was allowed to proceed on her last cruise at a time when admiralty calculations had shown she was dangerously wanting in stability. People often affect to set value upon mathematical calculations and to be guided by their results, who yet hesitate to place full reliance in these calculations when brought to the sticking point of either acting upon them or the contrary. There is the feeling that, after all, the data used may not be quite trustworthy, or that the conditions supposed may never occur in actual practice. Whatever may be the explanation, risks are often encountered as cheerfully as if their existence had never been suspected, and very often, too, it happens that, thanks to good luck, the predicted never occurs; and so the remnant of faith in scientific investigation, which had hitherto been cherished, is finally extinguished. Trial and error has been the basis of most of our progress in naval design, and the errors have often to be paid for very dearly indeed, as in the sad instance we have now under consideration.

And so the Cobra was purchased, after receiving as much additional strengthening as was practicable under the circumstances. The strengthening seems to have consisted for the most part of the longitudinal girder fitted under the deck beams in the range of the sides of the hatchways and funnel casings. The Viper was, from the first, favorably designed in this respect. She had a continuous girder, about 15 in. high, and situated at 3½ ft. on each side of the middle line, which served, where necessary, to form engine and funnel casings as well as hatchway coamings where the openings in the deck occurred. The Cobra had nothing of this kind, and so the admiralty officials suggested something to serve a similar purpose, but placed on the under side of the deck. Then, again, the bunker bulkheads in the Viper were continuous from deck to bilges on each side of the vessel, attached both to the deck plating and to the bottom plating; whereas the placing of an athwartship bunker between the boilers in the Cobra prevented the side bunkers in the way of the boilers from being wholly continuous. Such details as these, of course, assume greater proportions in the eye of a professional critic after the occurrence of such a disaster than they probably would if all had gone well. It would be very far from the truth to say the Cobra was carelessly designed, for the contrary was evidently the case. Those who were concerned in designing the vessel had every reason for carefully thinking out the question of how best to appropriate the weight of structural material at their disposal if she was to have the draught of water and displacement contemplated. An excess of displacement would interfere seriously with the attainment of the enormous speed contemplated, and insufficient strength would prove even still more ruinous to the vessel's efficiency and the builders' reputation. The evidence shows that calculations were made of the vessel's strength under very trying conditions, and probably these included the case of being among waves of her own length. The results of the calculations seem to have satisfied the Elswick company that she was strong enough, although the figures supplied at the court martial are not such as would suggest that such trying conditions of stress were expected to occur with frequency or over extended periods of time. The mild steel of which the Cobra was built has a tenacity of from 28 to 30 tons per square inch of sectional area, with an elastic limit which would be reached at about 14 tons per square inch. It seems that tensile strain of at least 9 tons was expected under conceivable conditions. Now 9 tons of extension and 9 tons of compression, alternately applied every few seconds, would surely fatigue the material after some hours, and seriously reduce its resistance to bending, if not to tension also. The well-known case of the Mary, which broke in two in the vicinity of the Bay of Biscay about twenty-five years ago, during fine weather illustrates this. The vessel in question got into an evenly undulating ground swell, forming waves of about her own length, and the crew, who were picked up, stated that she bent up and down about a transverse section at the middle of her length until at last she broke in two at that place. Similarly, the steamers Western Reserve and W. H. Gilcher, which were lost on Lake Erie in 1891, were said to have broken in the same way. In each of these vessels it was subsequently found that they were structurally defective, and that scantlings which would have

been sufficient for shorter vessels did not afford the necessary margins of safety for vessels of their lengths and proportions.

It may be urged that if the admiralty declined to take the Cobra, some other power would, and that it was desirable to prevent this latter contingency from occurring. But if that was the reason for acquiring the vessel, it was still imperatively necessary that prudence should have accompanied the use to be made of her. Mr. Parsons, of the Turbine company, said in his evidence that he considered these destroyers as fine-weather boats. Perhaps others concerned with the case took a similar view. Indeed, the navigating instructions given at the admiralty office to Lieut. Bosworth Smith, her commander on the disastrous voyage, seem to indicate that at Whitehall it was known she ought to be handled tenderly. It is to be hoped for the credit of the constructive department that such was the case. For, knowing what they did about the structural deficiencies of the Cobra, it was clearly their duty to warn their lordships on the subject, and insist that she should be viewed as an experimental design rather than as an addition to the navy fit for any service upon which a destroyer might be expected to be employed.

Whatever may have actually been said to Lieut. Bosworth Smith about the craft he was to navigate from the Tyne to Portsmouth, it is evident from his subsequent action that he thought the vessel fit to be taken to sea on a night that could scarcely be termed fair. Mr. Barnard, of the Parsons company, and Mr. Sanderson, of the Elswick company, seem to have offered no objection to the voyage being undertaken in such weather; for if they did it must certainly have come to the knowledge of Mr. Percey, the chief engineer, who said nothing on the subject in his evidence. Indeed, that officer appears to have been so far from suspecting that she was structurally weak, that in his telegram to the admiralty from Middlesbrough he attributed the disaster to striking a rock.

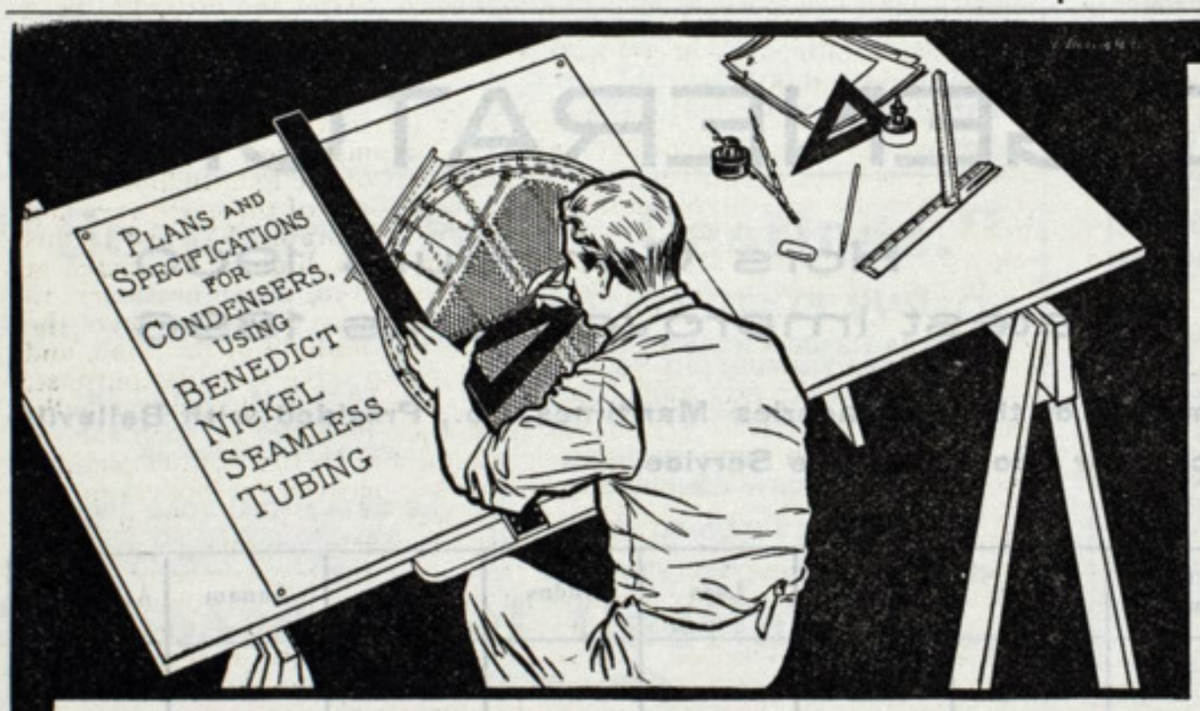
The evidence, however, clearly showed, despite all attempts at suggesting other possibilities, that the vessel got into bad weather, encountered heavy seas, and after rolling very badly for some time, ultimately broke in two somewhere not far from the middle of her length. Some of the survivors stated that they distinctly saw the hull hinging, as it were, up and down somewhere between her third and fourth funnels before finally breaking in two at that place. That the chief engineer did not see this, but felt a shock as of striking something, does not weaken the value of the other evidence, as each could only describe what he saw and felt in a brief space of time under circumstances of great mental strain. A man standing at the stern would, in all likelihood, see more of what was going on amidships than one standing upon a bridge immediately above it; and the shock felt by the chief engineer was doubtless due to the parting asunder of the fractured portions of the vessel. The evidence, as already remarked, pointed to but one conclusion—the conclusion adopted by the court—that the Cobra broke in two near amidships without previously striking anything harder than water, such being due to the vessel not being strong enough, and consequently she should not have been purchased by the admiralty for service as a destroyer. This is practically the verdict of the court-martial, and it expresses the opinion which practical men had already arrived at. That she was worth buying for experimental purposes is quite another matter. It is not the purchase of the boat that was a mistake, but the use made of her.

The question now arises: Are all our torpedo destroyers similarly weak, or, if not absolutely so weak as the Cobra, are they fit for fighting in bad weather That is a question which the admiralty must investigate and answer. Speed is undoubtedly a most valuable quality in a ship of war, and more especially in craft of this description. But having these high speeds of 27 to 35 knots, which it is known destroyers may be built to attain, can the vessels be safely used in other than fairly smooth water? It is clearly of no use sending these vessels to sea with a fleet if they cannot be used under the same conditions of weather as those in which an engagement might be fought. We do not suggest that the great majority of our cleverly-designed fleet of destroyers cannot do this—the contrary has been proved over and over again; but the nation will expect to be satisfied on this point, and steps must be taken to afford the desired satisfaction. Of one thing we may be sure, the margin of safety is not a large one in any case. But, in war, risks must be taken; only the risk should be reasonable and justifiable under all circumstances. The commander of the Viper was acquitted on these grounds for losing his vessel upon rocks in a fog; and the fleet is full of officers willing to take similar risks. But to command a vessel, or to sail in one as a member of the crew, which is liable in a choppy sea to break in two and sink beneath one's feet, is not a reasonable risk, and the country's money must not be spent on such vessels.

The circumstances of the Cobra disaster are painful in the extreme, and our deepest sympathy goes out to the relatives of the men of the navy and of the contracting firms in their sorrow, a sorrow which one cannot help feeling they might have been spared if everybody concerned had acted with the prudence and foresight which should have been expected of them. This loss of life, and the sorrow consequent thereon, will, however, not have been in vain if the mischief ends with the loss of one vessel, and if steps are taken to ensure the reasonable safety of the others of the type.

A full summary of the commerce of the canals at Sault Ste. Marie (Canadian and United States) to Nov. 1 is not yet at hand, but the figures available show a total of 4,174,545 tons of freight moved through the canals during October. This exceeds the traffic of the corresponding month last year by nearly 1,000,000 tons. The commerce each month during the past five has exceeded the 4,000,000-ton mark, and the total at the end of October was 24,543,610 tons, which is within 100,000 tons of last year's total for the full season. The season is sure to be a record breaker. The principal items of freight during October were: Wheat, 9,362,647 bushels; other grain, 3,758,519 bushels; iron ore, 2,699,242 tons; flour, 1,277,737 bushels.

Arthur Sewall & Co., Bath, Me., are about to build a five-masted steel schooner.



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V. WARING, N.Y.

ACTIVITY IN SEABOARD SHIP YARDS.

A NUMBER OF IMPORTANT CONTRACTS ARE SECURED AND OTHERS ARE CONTEMPLATED—SEVERAL LAUNCHES.

The William R. Trigg Co., Richmond, Va., launched the new revenue cutter Tuscarora last week. The vessel is intended for service on the great lakes and is of the following dimensions: Length over all, 178 ft.; length between perpendiculars, 162 ft.; beam, molded, 30 ft.; depth at side from base line amidships, 15 ft. The hull is of steel throughout and fitted with eight watertight athwartship bulkheads. The keel is of the flat type, composed of two thicknesses of plates, 14 lbs. per square foot and well riveted together. Above these inner and outer flat keels is a vertical keel of 15 lbs. per square foot, reinforced with double angles. There are six intercostal longitudinals, three on each side of the vertical keel, standing square with the outside plating. The pilot house and chart room are located on the forecastle deck, just aft of the foremast. These houses are built of steel complete except the doors in the pilot house. The steering of the vessel is done by a steam steerer, which is so arranged that it can be operated by hand or steam from the pilot house, and steam from the top of the bridge. A screw hand-gear is also fitted aft over the top of rudder head. The berthing space for the crew is on the berth deck forward and also under the forecastle deck. Mess lockers, water closets and bath rooms are fitted for the men's convenience. The petty officers, boatswain, carpenter and oiler have their staterooms and mess rooms directly aft of the crew's space on the berth deck. The wardroom officers are located on the berth deck aft of the machinery space. The ward dining room runs the whole length of the wardroom between the wardroom officers' staterooms. Buffet, writing desk, tables and chairs are fitted for the convenience of the officers. The captain's quarters are located directly aft of the wardroom, under the main deck, where he will have his pantry, office, cabin, stateroom and bath room, all fitted in the best possible manner. The main engine is of the vertical, inverted-cylinder, direct-acting, triple-expansion, surface-condensing type with cylinders of 17, 27, and 43 in. diameter and 24 in. stroke. Steam will be furnished by two single-ended boilers of the horizontal return fire-tube type, constructed for a working pressure of 160 lbs. per square inch. Each boiler will have three Morison corrugated furnaces of 39 in. internal diameter. The total heating surface will be about 3,000 sq. ft.; grate surface, 108 sq. ft. The boilers will be 11.8 ft. outside diameter and 10 ft. long over all. Independent feed pumps will be fitted in fire and engine rooms. The forced draft will be of the closed fire-room system; air will be supplied by one blower, which will discharge into the fire room. There will be one See hydro-pneumatic ash ejector. The contract price of the vessel was $157,000.

The Townsend & Downey Ship Building & Repair Co., Shooter's island, N. Y., has just laid the keel for the new schooner yacht for the German emperor. The vessel will be built entirely of steel and will be of the following dimensions: Length over all, 160 ft.; length on water line, 120 ft.; beam, 27 ft.; draught, 15 ft. The interior will be very elaborate. The cabin and guests' room will be finished in mahogany and the emperor's apartments in white and gold. The emperor's suite will take up almost half of the space on the starboard side of the yacht aft. The sleeping apartments will have a folding bed which will allow the room to be used as a private office during the day. Opening from the sleeping apartment is a private dressing room and a step from this room will take the kaiser to the brink of a beautifully appointed plunge bath. The yacht will cost about $125,000.

Plans for securing two large ship yards for Seattle are now before the chamber of commerce of that city. The subject was presented to the chamber in the following letter from Mr. Reif: "I have received a communication from the Atlantic coast ship building concern asking me to look up a location for a ship yard to build wooden steam and sailing vessels somewhere in the immediate vicinity of Seattle—about ten or fifteen acres of land on the sound or on a river with water deep enough to float an average vessel. The company will put in a plant costing from $250,000 to $300,000. I am also requested by a Pacific coast ship building concern to look up a site for them near Seattle."

At John Bishop's yard, Gloucester, Mass., the new schooner for John Pew & Son is practically completed. The new craft is a model type of a fisherman and is 110 ft. long, 23.10 ft. beam and 10.6 ft. deep. Mr. Bishop also has a contract for a big schooner pleasure yacht for Col. Nelson of Kansas City, which will be of the finest workmanship and finish throughout and will be of the following dimensions: Length, 125 ft.; beam, 25 ft.; depth, 11 ft.

D. Jarvis & Son, who for several years have operated a ship yard at Stockton, Cal., have acquired a site at Everett, Wash., and will open a ship yard there. The firm has been engaged in ship building for years on the Stockton channel and now has an order for four barges and three big dredgers for the Western Dredging Co., which will be completed before the change of location.

The Tacoma Ship Building Co., Tacoma, Wash., has been given a contract to build a four-masted barkentine for J. J. McKinnon & Co., San Francisco. The vessel will be 210 ft. over all, 40 ft. beam and 16 ft. depth of hold. The company has two vessels on the stocks which will presently be launched—a steam schooner and a barkentine.

It is expected that the cruising yacht Shenandoah, building by the Townsend & Downey Ship Building & Repair Co., Shooter's island, New York, for Gibson Fahnestock of New York, will be launched in December. The yacht will be 135 ft. over all, 100 ft. on the water line, 27 ft. beam, and her draught will be about 14 ft.

The four-masted schooner Henry B. Fiske was launched at the ship yard of George A. Gilchrist, Belfast, Me., a few days ago. She is owned by McQueston Bros. of Boston. The vessel's dimensions are: Length, 182 ft.; breadth, 37 ft. 8 in.; depth, 18.4 ft.

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Year.	Australien	Polynésien	Armand Béhic	Ville de la Ciotat	Ernest Simons	Chili	Cordillère	Laos	Indus	Tonkin	Annam	Atlantique
1890.....	67,728	2,460										
1891.....	68,247	68,331	204									
1892.....	68,247	68,403	69,822	23,259								
1893.....	68,379	68,343	68,286	68,247								
1894.....	68,439	68,367	68,574	68,439	37,701							
1895.....	68,673	68,766	68,739	68,808	40,887	28,713						
1896.....	69,534	92,718	69,696	69,549	62,205	63,153	40,716					
1897.....	68,250	69,606	92,736	69,555	62,235	76,110	63,357	43,146				
1898.....	70,938	69,534	69,552	69,597	62,526	63,240	63,240	62,553	63,954	22,707		
1899.....	69,534	69,615	67,431	90,405	60,246	62,778	62,868	52,344	54,855	44,007	22,884	
1900.....	69,534	67,494	69,744	69,564	61,719	62,382	62,502	51,471	53,373	62,016	63,066	52,140
Total.....	757,503	713,637	644,784	597,423	387,519	356,376	292,683	209,514	172,182	128,730	85,950	52,140

ATELIERS ET CHANTIERS DE L'ERMITAGE, À ST. DENIS (SEINE), FRANCE.
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INDUSTRIAL NOTES.

The McMyler Manufacturing Co., Cleveland, manufacturers of hoisting and conveying machinery, who are erecting a large plant at Warren, O., are calling for bids for the equipment of the plant. In addition to a large list of machine tools they are in the market for two horizontal boilers of 100 H.P. each, to be equipped with mechanical stokers; feed water heaters for 300 H.P. boilers and pumps for same; a 100-kw. 250-volt generator, direct connected to engine, and a number of motors.

The Brown Hoisting Machinery Co., Inc., Cleveland, are pushing work on their new plant and hope to have it under way before cold weather sets in. The temporary shops are crowded with work. At present the company reports an unsual demand for their patent blast furnace hoists and distributors.

The pattern shop of the Wellman-Seaver Engineering Co., Cleveland, is now in operation. The company expects to have the remainder of its plant in a completed state by the first of the year. This plant is intended to be a model of its kind.

C. O. Bartlett & Co., Cleveland, have taken a contract for a coal handling outfit to be erected at Sandusky, O., for the Columbus, Sandusky & Hocking railway. It will have a capacity of 700 tons per hour.

A 15 per cent. dividend has just been paid to stockholders of the Roberts Safety Water-Tube Boiler Co., New York. This company has been paying 10 per cent. annual dividends for several years past.

The Calvin Co., Ltd., Garden Island, Ont., has added one of the B-11 adjustable bevel band saw machines made by the Atlantic Works, Incorporated, of Philadelphia to the equipment of their ship yard.

In fair weather the Algiers dock will draw 7 ft. of water, but in a blow will be sunk to a depth of 18 ft. It is expected that the seas will wash all the way through her length of 500 ft. The sides of the dock, which are 55 ft. high and 400 ft. long, will receive in a gale a wind pressure of 350 tons, sufficient to drive a large sailing vessel at a 12-knot clip. No effort will be made to make any headway in a gale, and but 8 knots is expected in good weather.

Elder, Dempster & Co. now occupy the distinction of owning the largest fleet of cargo and passenger steamers under the British flag. The company controls 141 vessels of 368,490 gross tons. There are twelve steamers building of 44,800 tons gross. In speed the figures are as follows: 17 knots, one; 14 knots, eleven; 13 knots, seven; 12 knots, twelve; under 12 knots, 110.

Niclausse water-tube boilers have been ordered for the new Japanese cruisers Nutaka and Tsuchima. These vessels are of purely Japanese design.

Excursion rates to Florida via Baltimore & Ohio R. R. and Washington, D. C., passing through the beautiful cities of the south. Stop over privilege allowed on all round trip tickets. Two fast trains leave Cleveland daily at 3:00 and 11:20 p. m. Call at city ticket office, 241 Superior street. tf.

TRADE NOTES.

The James Reilly Supply & Repair Co., No. 229-230 West street, New York, has printed a book about their marine specialties. In the book the company calls particular attention to the water front as a convenient place for the repair of steamships, yachts, tugs and general marine work. The company is at all times in a position to undertake engine and boiler repairing, the renovating of cabins and all manner of ship carpentry, refitting of hulls, rigging and decks, and appliances for handling cargo. The company keeps constantly on hand all supplies necessary for repair work. In fact during the past twenty-five years it has practically done all the repair work for the International Navigation Co.'s lines—American and Red Star. A complete catalogue follows of the company's marine specialties. The book can be had for the asking.

The Lidgerwood Manufacturing Co., New York, has received four gold medals, one silver medal and one bronze medal for their various exhibits at the Pan-American exposition. All of the awards were the highest given in each particular class, and include a gold medal for mining engines and general hoisting engines, a gold medal for electric battleship hoist, such as the company furnished the Kearsarge and Kentucky of the United States navy, and a gold medal for the Lidgerwood-Miller marine cableway for coaling at sea; also a silver medal for electrical hoisting engines and a bronze medal for the new reversible drum swinging gear which is a feature of the latest type of the Lidgerwood derrick engines.

Bids will be opened at Washington at the bureau of supplies and accounts of the navy department on Nov. 5 for furnishing for the Mare Island navy yard, Mare Island, Cal., miscellaneous supplies including fifty dozen steel wire foundry casting brushes, about 20,000 lbs. of bar iron of various sizes, 7,000 lbs. of bar steel for gun mount bolts, 13,000 ft. of wrought iron galvanized steam pipe, 3,800 ft. of seamless brass pipe, and 700 sheets of steel, galvanized.

A particularly useful pump for boiler inspectors, marine engineers and boat owners generally, is that which is made by the Marine Iron Works, station A, Chicago, as illustrated on page 41 of their 1901 catalogue, which is sent free on receipt of request. 7

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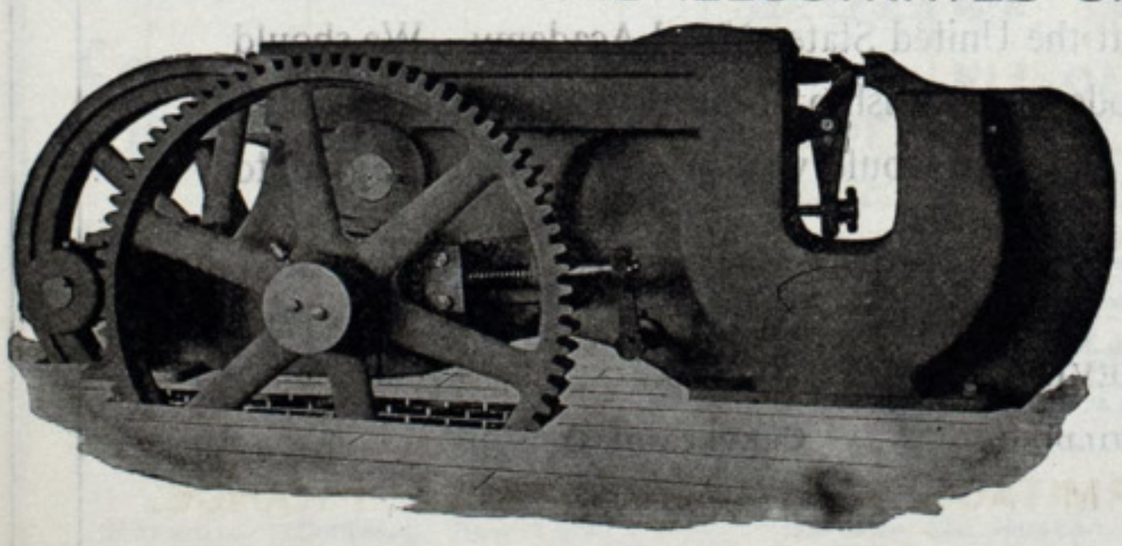

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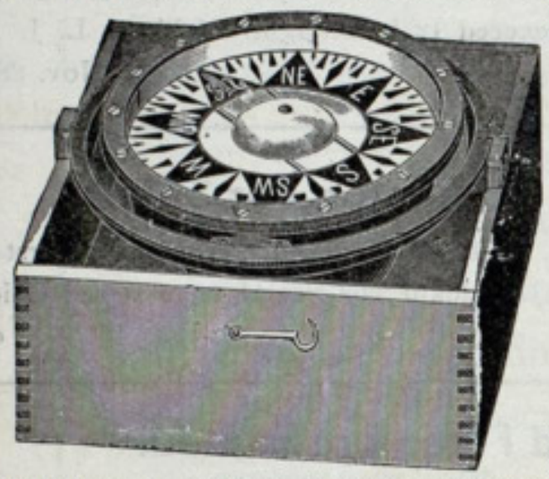

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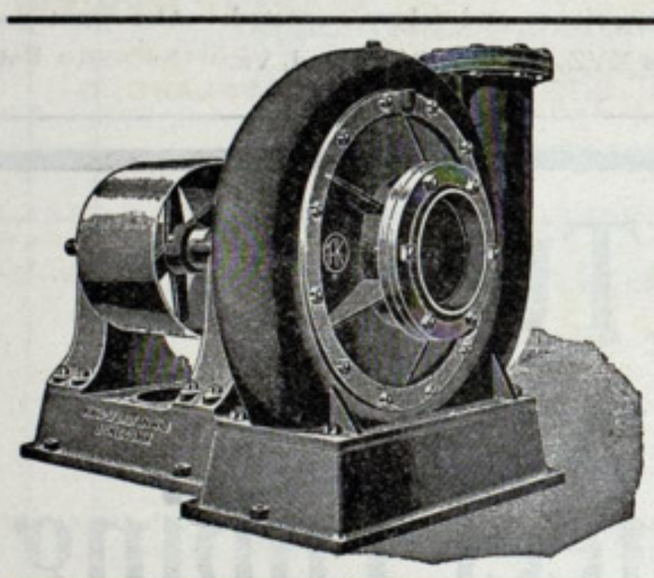

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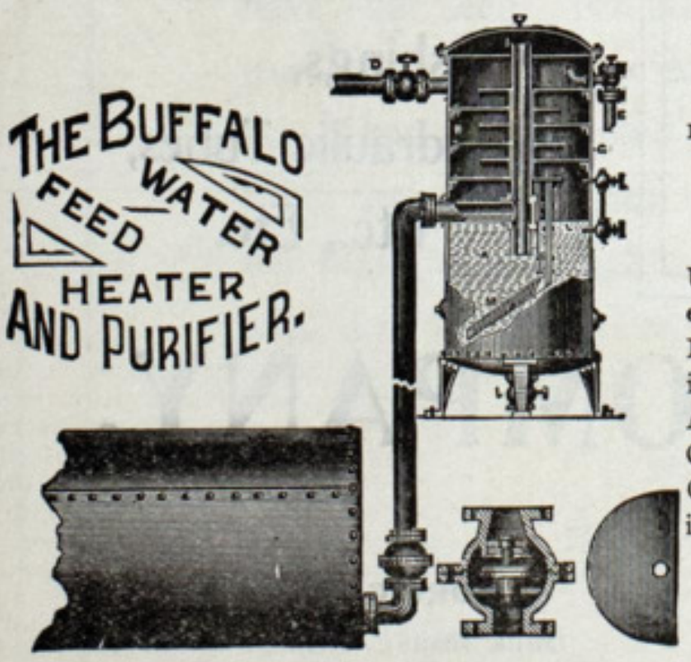

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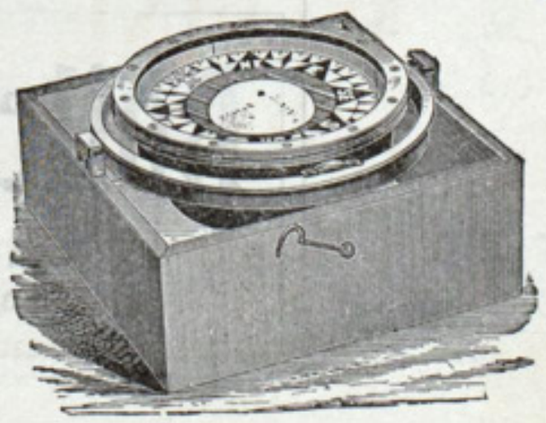

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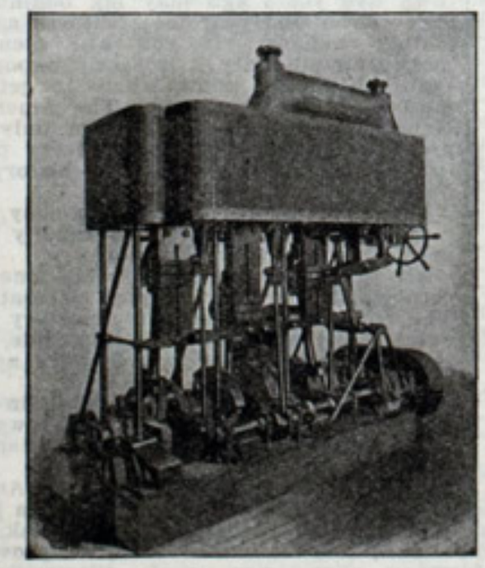

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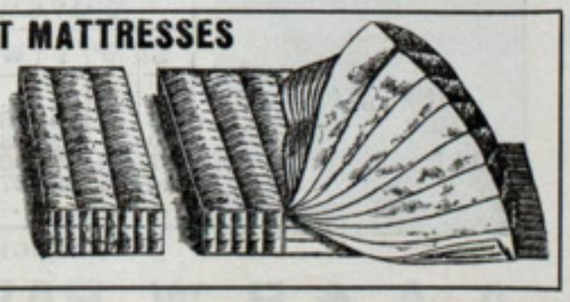

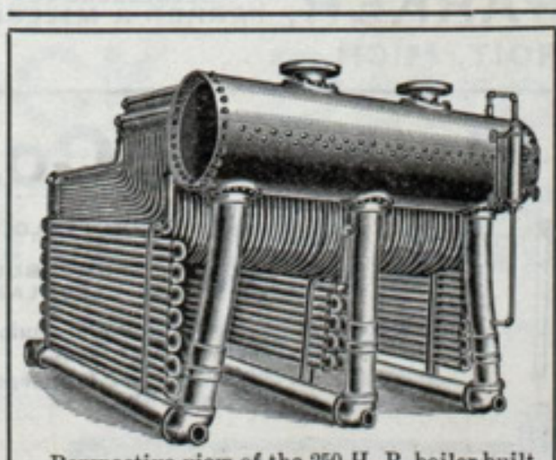

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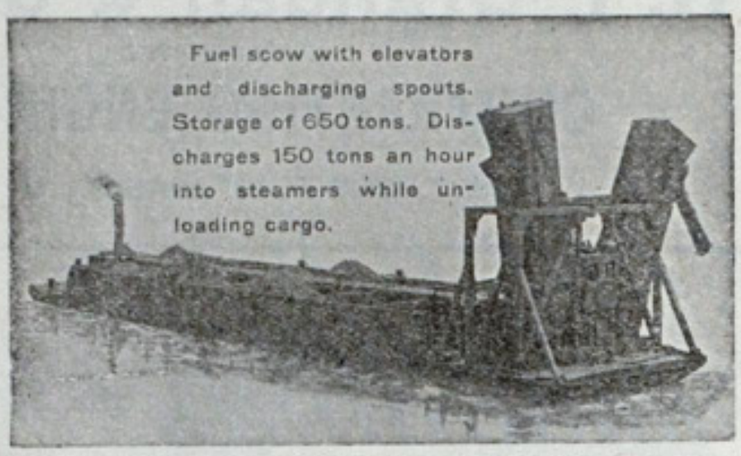

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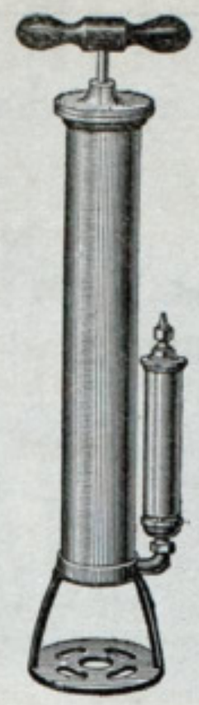

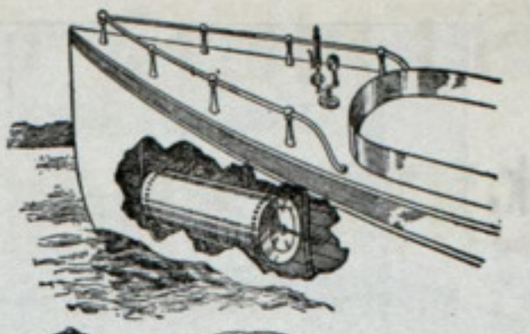

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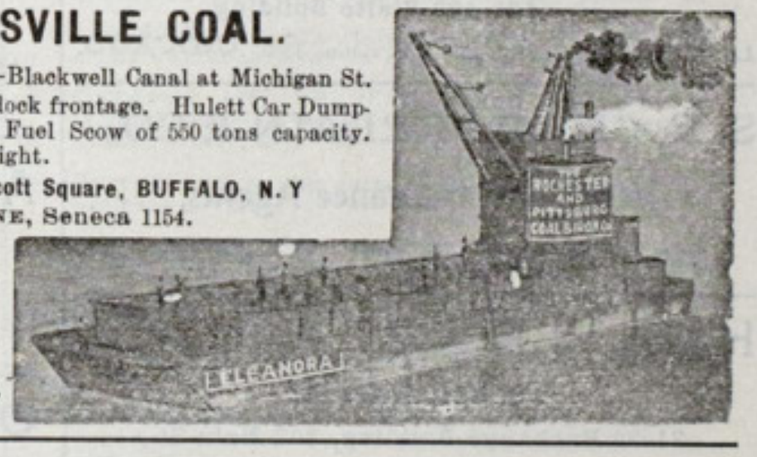

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Castner, Curran & Bullitt.....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.

COAL AND ORE HANDLING MACHINERY.

Brown Hoisting Machinery Co., Incorporated..Cleveland.
Lidgerwood Mnfg. Co.....New York.

COMPASSES.

Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

CORK JACKETS AND RINGS.

Armstrong Cork Co.....Pittsburgh, Pa.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

CRANES, CONVEYORS, HOISTS.

Brown Hoisting Machinery Co., Incorporated..Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Niles Tool Works Co.....Hamilton, O.
Westinghouse Electric & Mnfg. Co.....Pittsburg.
Wood & Co., R. D.....Philadelphia.

CRANK PINS.

Cleveland City Forge & Iron Co.....Cleveland.

DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.
Schrader's Son, A.....New York.

DRILL PRESSES—DRILLS OF ALL KINDS.

Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

DRILLS, PNEUMATIC.

Standard Pneumatic Tool Co.....Chicago.

DRYING APPARATUS.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Sturtevant, B. F. Co.....Boston.

DRY DOCKS.

American Ship Building Co.....Cleveland.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Chicago Ship Building Co.....Chicago.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Harlan & Hollingsworth Co.....Wilmington, Del.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Shipowners Dry Dock Co.....Chicago.

ELECTRIC LIGHT AND POWER PLANTS.

Badt-Goltz Engineering Co.....Chicago.
Buffalo Forge Co.....Buffalo.
Electro-Dynamic Co.....Philadelphia.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Seidler-Miner Electric Co.....Detroit.
Sturtevant, B. F. Co.....Boston.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC HOISTS AND CRANES.

Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Lidgerwood Mnfg. Co.....New York.
Westinghouse Electric & Mnfg. Co.....Pittsburg, Pa.

ELECTRIC STEERING GEAR, SPEED AND RUDDER INDICATORS, ETC.

Electro-Dynamic Co.....Philadelphia.

ENGINE BUILDERS, MARINE.

American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Chicago Ship Building Co.....Chicago.
Chase Machine Co.....Cleveland.
Craig Ship Building Co.....Toledo, O.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fletcher, W. & A. Co.....Hoboken, N. J.
Fore River Ship & Engine Co.....Quincy, Mass.
Gas Engine & Power Co. and Chas. L. Seabury & Co., Consolidated.....New York.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit.
Jenks Ship Building Co.....Port Huron, Mich.
Lake Shore Engine Works.....Marquette, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Olds Motor Works.....Detroit.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Sheriffs Mnfg. Co.....Milwaukee.
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.
Willard, Chas. P. & Co.....Chicago.

ENGINE ROOM TELEGRAPH, CALL BELLS, ETC.

Cory, Chas. & Son.....New York.
Electro-Dynamic Co.....Philadelphia.
Seidler-Miner Electric Co.....Detroit.

ENGINEERING SPECIALTIES AND SUPPLIES.

Crane Co.....Chicago.
Reilly Repair & Supply Co., James.....New York.

ENGINEERS, MARINE AND MECHANICAL.

Electro-Dynamic Co.....Philadelphia.
Gaskin, Edward.....Buffalo.
Holmer & Goodenough.....New York.
Hunt, Robt. W. & Co.....Chicago.
Miller, Walter.....Cleveland.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.
Powell, Ambrose V.....Chicago.
Roelker, H. B.....New York.
See, Horace.....New York.
Wood, W. J.....Chicago.

EVAPORATING AND DISTILLING APPARATUS.

Reilly Repair & Supply Co., James.....New York.

FANS FOR VENTILATION, EXHAUST, ETC.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FEED WATER PURIFIERS AND HEATERS.

Learmonth, Robert.....Buffalo.
Reilly Repair & Supply Co., James.....New York.
Smith, W. Blackburn.....Perth Amboy, N. J.

FIRE EXTINGUISHING APPARATUS.

Clayton Fire Extinguishing & Disinfecting Co.New York.

FIXTURES FOR LAMPS, OIL AND ELECTRIC.

Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

FOG SIGNALS.

Colt Co., J. B.....New York.
Hamilton-Foster Fog Signal Co.....New York.

FORGES.

Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

FORGINGS FOR CRANK, PROPELLER OR THRUST SHAFTS, ETC.

Cleveland City Forge & Iron Co.....Cleveland.
Fore River Ship & Engine Co.....Quincy, Mass.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

FURNACES FOR BOILERS.
Continental Iron Works.....New York.

FUELING COMPANIES AND COAL DEALERS.
Castner, Curran & Bullitt (Pocahontas).....Philadelphia.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.
Pittsburg Coal Co.....Cleveland.
Rochester & Pittsburgh Coal & Iron Co.....Buffalo.
Smith, Stanley B. & Co.....Detroit.
Youghiogheny & Lehigh Coal Co.....Chicago.

GAS BUOYS.
Safety Car Heating & Lighting Co.....New York.

GAS AND GASOLINE ENGINES.
Chase Machine Co.....Cleveland.
Lake Shore Engine Works.....Marquette, Mich.
Olds Motor Works.....Detroit.

GAGES, STEAM AND VACUUM.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

GRAPHITE.
Dixon Crucible Co., Joseph.....Jersey City, N. J.

GRAPHITE BUSHINGS AND BEARINGS.
Graphite Lubricating Co.....Bound Brook, N. J.

HAMMERS, PNEUMATIC.
Standard Pneumatic Tool Co.....Chicago.

HAMMERS, STEAM.
Bement, Miles & Co.....Philadelphia.
Chase Machine Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.

HATCH GEARS.
"Long Arm" System Co.....Cleveland.

HAWSERS, WIRE.
American Steel & Wire Co.....Chicago.

HEATING APPARATUS.
Sturtevant, B. F. Co.....Boston.

HOISTS FOR CARGO, ETC.
American Ship Building Co.....Cleveland.
Brown Hoisting Machinery Co., Incorporated..Cleveland.
Chase Machine Co.....Cleveland.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....New York.
Hodge, S. F. & Co.....Detroit.
Hyde Windlass Co.....Bath, Me.
Lidgerwood Mnfg. Co.....New York.
Marine Iron Co.....Bay City.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

HOSE FOR PNEUMATIC TOOLS.
Sayen & Schultz.....Philadelphia.

HYDRAULIC MACHINERY.
Bement, Miles & Co.....Philadelphia.
Watson-Stillman Co., The.....New York.
Wood & Co., R. D.....Philadelphia.

ICE MACHINERY.
Roelker, H. B.....New York.

INDICATORS FOR STEAM ENGINES.
American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

INJECTORS.
Crane Co.....Chicago.
Jenkins Bros.....New York.

INSURANCE, MARINE.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Helm, D. T. & Co.....Duluth, Minn.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
La Salle & Co.....Duluth.
Mitchell & Co.....Cleveland.
Osborn, F. H. & Co.....Chicago.
Parker, A. A. & W. B.....Detroit.
Peck, Chas. E. & W. F.....New York and Chicago.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

IRON ORE AND PIG IRON.
Bourne-Fuller Co.....Cleveland.
Hanna, M. A. & Co.....Cleveland.
Pickands, Mather & Co.....Cleveland.

IRON OR STEEL STAYBOLTS, HOLLOW OR SOLID.
Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

LATHES OF ALL KINDS.
Niles Tool Works Co.....Hamilton, O.
Pratt & Whitney Co.....Hartford, Conn.

LAUNCHES—NAPHTHA, ELECTRIC.
Gas Engine & Power Co.....New York.

LIFE PRESERVERS, LIFE BOATS, BUOYS, RAFTS, ETC.
Armstrong Cork Co.....Pittsburg.
Drein, Thos. & Son.....Wilmington, Del.
Kahnweiler's Sons, D.....New York.
Lane & DeGroot.....Brooklyn.

LIGHTS, SIDE AND SIGNAL.
Page Bros. & Co.....Boston.
Porter's Sons' Co., Wm.....New York.

LOGS.
Walker & Son, Thomas.....Birmingham, Eng.
Also Ship Chandlers.

MACHINE TOOLS (WOOD WORKING).
Atlantic Works, Inc.....Philadelphia.

MACHINE TOOLS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.

MALLETS FOR CAULKERS, BOILER MAKERS, ETC.
N. Y. Mallet & Handle Works.....New York.

MARINE RAILWAYS, BUILDERS OF
Crandall & Son, H. I.....East Boston, Mass.

MATTRESSES, CUSHIONS, BEDDING.
Fogg, M. W.....New York.
Lein, Irvine & Co.....New York.

MECHANICAL DRAFT FOR BOILERS.
American Blower Co.....Detroit.
American Ship Building Co.....Cleveland.
Boston Blower Co.....Hyde Park, Mass.
Bloomsburg & Co., H.....Newport News, Va.
Buffalo Forge Co.....Buffalo.
Detroit Shipbuilding Co.....Detroit.
Sturtevant, B. F. Co.....Boston.

METALLIC PACKING.
Katzenstein, L. & Co.....New York.
U. S. Metallic Packing Co.....Philadelphia.

METALS FOR BEARINGS.
Cramp, Wm. & Sons.....Philadelphia.
Phosphor Bronze Smelting Co., Ltd.....Philadelphia.

METAL POLISH.
Bertram's Oil Polish Co.....Boston, Mass.

MILLING MACHINES OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

NAUTICAL INSTRUMENTS.
Bliss, John & Co.....New York.
Ritchie, E. S. & Sons.....Brookline, Mass.

NAUTICAL SCHOOL.
Chicago Nautical School.....Chicago.

NAVAL ARCHITECTS.
Gaskin, Edward.....Buffalo.
Holmer & Goodenough.....New York
See, Horace.....New York.
Wood, W. J.....Chicago.

OAKUM.
Stratford Oakum Co., Geo.....Jersey City, N. J.

OILS AND LUBRICANTS.
Dixon Crucible Co., Joseph.....Jersey City, N. J.
Standard Oil Co.....Cleveland.

PACKING.
Crane Co.....Chicago.
Garlock Packing Co.....Palmyra, N. Y.
Jenkins Bros.....New York.
Katzenstein, L. & Co.....New York.
Sayen & Schultz.....Philadelphia.
U. S. Metallic Packing Co.....Philadelphia.

PAINTS.
Baker, Howard H. & Co.....Buffalo.
Toch Bros.....New York.
Upson-Walton Co.....Cleveland.

PATENT ATTORNEYS.
Thurston & Bates.....Cleveland.

PATTERN SHOP MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PIPE THREADING AND CUTTING MACHINES.
Merrell Mnfg. Co.....Toledo, O.

PIPE, WROUGHT IRON.
Bourne-Fuller Co.....Cleveland.
Crane Co.....Chicago.

PLANERS OF ALL KINDS.
Bement, Miles & Co.....Philadelphia.
Niles Tool Works Co.....Hamilton, O.

PLANING MILL MACHINERY.
Atlantic Works, Inc.....Philadelphia.

PLATE BENDING AND PLANING MACHINES.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood & Co., R. D.....Philadelphia.

PLUMBING, MARINE.
Reilly Repair & Supply Co., James.....New York.
Sands, Alfred B. & Son.....New York.

PNEUMATIC TOOLS.
Standard Pneumatic Tool Co.....Chicago.

POLISH FOR METALS.
Bertram's Oil Polish Co.....Boston.

POWER DOORS AND HATCHES.
"Long Arm" System Co.....Cleveland.

PRESSURE REGULATORS.
D'Este Co., Julian.....Boston.

PROPELLER WHEELS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Cramp, Wm. & Sons.....Philadelphia.
Detroit Shipbuilding Co.....Detroit.
Farrar & Trefts.....Buffalo.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Hyde Windlass Co.....Bath, Me.
Harlan & Hollingsworth Co.....Wilmington, Del.
Hodge, S. F. & Co.....Detroit
Jenks Ship Building Co.....Port Huron, Mich
Lockwood Mnfg. Co.....East Boston, Mass.
MacKinnon Mfg. Co.....Bay City, Mich.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J
Phosphor Bronze Smelting Co., Ltd.....Philadelphia
Pusey & Jones Co.....Wilmington, Del
Risdon Iron Works.....San Francisco
Roelker, H. B.....New York.
Sheriffs Mnfg. Co.....Milwaukee
Trigg, Wm. R. Co.....Richmond, Va.
Trout, H. G.....Buffalo.

PROJECTORS, ELECTRIC.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

PUMPS FOR VARIOUS PURPOSES.
Blake, Geo. F. Mnfg. Co.....New York.
Kingsford Foundry & Machine Works.....Oswego, N. Y.
Wood, R. D. & Co.....Philadelphia.
Worthington, Henry R.....New York.

PUNCHES, RIVETERS, SHEARS.
Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
Niles Tool Works Co.....Hamilton, O.
Wood, R. D. & Co.....Philadelphia.

REFRIGERATING MACHINERY.
Roelker, H. B.....New York.

REGISTER FOR CLASSIFICATION OF VESSELS.
Great Lakes Register.....Cleveland.

RELEASING HOOKS FOR DETACHING BOATS.
Standard Automatic Releasing Hook Co.....New York.

RIVETS, STEEL, FOR SHIPS AND BOILERS.
Bourne-Fuller Co.....Cleveland.
Champion Rivet Co.....Cleveland.

R. I. W. DAMP RESISTING PAINT.
Toch Bros.....New York.

RIGGING ROPE (WIRE).
American Steel & Wire Co.....Chicago.

RUBBER GOODS.
Hale Rubber Co., Alfred.....So. Boston, Mass.

RUBBER INSULATED WIRES.
Roebling's Sons, John A.....New York and Cleveland.
American Steel & Wire Co.....Chicago.

SAFETY VALVES.
American Steam Gauge Co.....Boston
Ashton Valve Co.....Boston
Crosby Steam Gage & Valve Co.....Boston

SAIL MAKERS.
Baker, Howard H. & Co.....Buffalo.
Upson-Walton Co.....Cleveland.
Wilson & Silsby.....Boston.

SALVAGE COMPANIES.
See wrecking companies.

SEAM COMPOSITION AND ELASTIC SEAM PAINT.
Cole & Kuhls.....Brooklyn.

SEARCH LIGHTS.
Badt-Goltz Engineering Co.....Chicago.
Elwell-Parker Electric Co.....Cleveland.
General Electric Co.....Schenectady, N. Y.
Rushmore Dynamo Works.....Jersey City, N. J.
Seidler-Miner Electric Co.....Detroit.
Westinghouse Electric & Mnfg. Co.....Pittsburg.

SHAPERS.
Bement, Miles & Co.....Philadelphia
Niles Tool Works Co.....Hamilton, O
Pratt & Whitney Co.....Hartford, Conn.

SHEARS.
See punches, riveters and shears.

SHIP AND BOILER PLATES AND SHAPES.
Bourne-Fuller Co.....Cleveland.

SHIP BUILDERS.
American Ship Building Co.....Cleveland.
Atlantic Works.....East Boston, Mass.
Bath Iron Works, Ltd.....Bath, Me.
Buffalo Dry Dock Co.....Buffalo.
Cramp, Wm. & Sons.....Philadelphia.
Craig Ship Building Co.....Toledo, O.
Chicago Ship Building Co.....Chicago.
Detroit Shipbuilding Co.....Detroit.
Fore River Ship & Engine Co.....Quincy, Mass.
Hardy, John B.....Tacoma, Wash.
Harlan & Hollingsworth Co.....Wilmington, Del.
Jenks Ship Building Co.....Port Huron, Mich.
Lockwood Mnfg. Co.....East Boston, Mass.
Maryland Steel Co.....Sparrow's Point, Md.
Moran Bros. Co.....Seattle, Wash.
Neafie & Levy Ship & Engine Bldg. Co.....Philadelphia.
Newport News Ship Building Co.....Newport News, Va.
Nixon, Lewis.....Elizabeth, N. J.
Pusey & Jones Co.....Wilmington, Del.
Risdon Iron Works.....San Francisco.
Roach's Ship Yard.....Chester, Pa.
Trigg, Wm. R. Co.....Richmond, Va.
Willard, Chas. P. & Co.....Chicago.

SHIP CHANDLERS.
Baker, Howard H. & Co.....Buffalo.
Moran Bros. Co.....Seattle, Wash.
Reilly Repair & Supply Co., James.....New York.
Upson-Walton Co.....Cleveland.

BUYERS' DIRECTORY OF THE MARINE TRADE.—Continued.

SOUNDING APPARATUS.

Farr, C. W.....Chicago.

SPARS—LARGE SIZES.

Moran Bros. Co.....Seattle, Wash.

STAYBOLTS, IRON OR STEEL, HOLLOW OR SOLID.

Falls Hollow Staybolt Co.....Cuyahoga Falls, O.

STEAM VESSEL FOR SALE.

Holmes, Samuel.....New York.

STEAMSHIP LINES, PASS. AND FREIGHT.

American Line.....New York.
Cleveland & Buffalo Transit Co.....Cleveland.
Clyde Line.....New York.
Dominion Line.....Boston.
Erie & Western Trans. Co.....Buffalo.
International Nav. Co.....Philadelphia.
Red Star Line.....New York.

STEEL CASTINGS.

Seaboard Steel Casting Co.....Chester, Pa.

STEERING APPARATUS.

American Ship Building Co.....Cleveland.
Chase Machine Co.....Cleveland.
Detroit Shipbuilding Co.....Detroit.
Electro-Dynamic Co.....Philadelphia.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.
Queen City Engineering Co.....Buffalo.
Sheriffs Mnfg. Co.....Milwaukee.

STOCKS, BONDS, SECURITIES.

Wright, Herbert & Co.....Cleveland.

STOCKLESS ANCHORS.

Baldt Anchor Co.....Chester, Pa.
International Anchor Co.....Cleveland.

SUBMARINE DIVING APPARATUS.

Hale Rubber Co., Alfred.....So. Boston, Mass.
Schrader's Son, A.....New York.

SURVEYORS, MARINE.

Holmer & Goodenough.....New York
Gaskin, Edward.....Buffalo.
See, Horace.....New York.
Wood, W. J.....Chicago.

TELEGRAPH—DECK AND ENGINE ROOM.

Cory, Chas. & Son.....New York.

TESTS OF MATERIAL.

Hunt, Robert W. & Co.....Chicago.
Pittsburgh Testing Laboratory, Ltd.....Pittsburg.

THERMOMETERS FOR MECHANICAL PURPOSES.

Helios-Upton Co.....Peabody, Mass.

TOOLS, METAL WORKING, FOR SHIP AND ENGINE WORKS.

Bement, Miles & Co.....Philadelphia.
Cleveland Punch & Shear Works Co.....Cleveland.
New Doty Mnfg. Co.....Janesville, Wis.
Niles Tool Works Co.....Hamilton, O.
Pond Machine Tool Co.....Plainfield, N. J.
Pratt & Whitney Co.....Hartford, Conn.
Standard Pneumatic Tool Co.....Chicago.
Watson-Stillman Co.....New York.
Wood, R. D. & Co.....Philadelphia.

TOOLS, WOOD WORKING.

Atlantic Works, Inc.....Philadelphia.

TOPOPHONE—Prevents disasters in fogs.

Colt Co. J. B.....New York.

TOWING MACHINES.

American Ship Windlass Co.....Providence, R. I.
Chase Machine Co.....Cleveland.

TOWING COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

TRAPS, STEAM.

D'Este Co., Julian.....Boston.
Haines Co., Wm. S.....Philadelphia.

TRUCKS.

Boston & Lockport Block Co.....Boston.

TUBING, SEAMLESS.

Benedict & Burnham Mnfg. Co.....Waterbury, Conn.
Standard Seamless Tube Co.....Pittsburg.

VALVES, STEAM SPECIALTIES, ETC.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crane Co.....Chicago.
Crosby Steam Gage & Valve Co.....Boston.
D'Este Co., Julian.....Boston.
Jenkins Bros.....New York.
Wood & Co., R. D.....Philadelphia.

VARNISH PAINT.

Mair, John & Son.....Philadelphia.

VESSEL AND FREIGHT AGENTS.

Boland, John J.....Buffalo.
Brown & Co.....Buffalo.
Chamberlain & Co., S. R.....Chicago.
Drake & Maytham.....Buffalo.
Elphicke, C. W. & Co.....Chicago.
Hall & Root.....Buffalo.
Helm, D. T. & Co.....Duluth, Minn.
Holmes, Samuel.....New York.
Hutchinson & Co.....Cleveland.
Keith, J. G. & Co.....Chicago.
Kennedy Hunter & Co.....Antwerp.
Mitchell & Co.....Cleveland.
Richardson, W. C.....Cleveland.
Sullivan, D. & Co.....Chicago.
Tandy, Frank N.....Boston.

VENTILATING APPARATUS FOR SHIPS.

American Blower Co.....Detroit.
Boston Blower Co.....Hyde Park, Mass.
Buffalo Forge Co.....Buffalo.
Sturtevant, B. F. Co.....Boston.

WIRE ROPE AND WIRE ROPE FITTINGS.

American Steel & Wire Co.....Chicago.
Baker, H. H. & Co.....Buffalo.
Roebling's Sons, John A.....New York and Cleveland.
Upson-Walton Co.....Cleveland.

WHISTLES, STEAM.

American Steam Gauge Co.....Boston.
Ashton Valve Co.....Boston.
Crosby Steam Gage & Valve Co.....Boston.

WINDLASSES.

American Ship Windlass Co.....Providence, R. I.
American Ship Building Co.....Cleveland.
Hyde Windlass Co.....Bath, Me.
Jenks Ship Building Co.....Port Huron, Mich.

WINCHES.

American Ship Windlass Co.....Providence, R. I.
Hyde Windlass Co.....Bath, Me.

WOOD WORKING MACHINERY.

Atlantic Works, Inc.....Philadelphia.

WRECKING AND SALVAGE COMPANIES.

Donnelly Salvage & Wrecking Co.....Kingston, Ont.
Midland Towing & Wrecking Co., Ltd.....Midland, Ont.
Swain Wrecking Co.....Detroit.

YACHT SAILS, FITTINGS, HARDWARE, ETC.

Wilson & Silsby.....Boston.

YACHT AND BOAT BUILDERS.

Drein, Thos. & Son.....Wilmington, Del.
Gas Engine & Power Co.....New York.
Lane & DeGroot.....Brooklyn.
Willard, Chas. P. & Co.....Chicago.

YAWLS.

Drein, Thos. & Son.....Wilmington, Del.
Lane & DeGroot.....Brooklyn.

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American Line 7
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American Ship Windlass Co. 2
American Steam Gauge Co. 1
American Steel & Wire Co. 1
Armstrong Cork Co. 40
Ashton Valve Co. 12
Atlantic Works 5
*Atlantic Works, Inc. 7

Babcock & Wilcox Co. 11
Badt-Goltz Engineering Co. 29
Baldt Anchor Co. 9
Baker, Howard H. & Co. 6
Bath Iron Works, Ltd. 1
Bement, Miles & Co. 3
Benedict & Burnham Mnfg. Co. 25
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Buffalo Forge Co. 12

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Cory, Chas. & Son 10
*Craig Ship Building Co. 30
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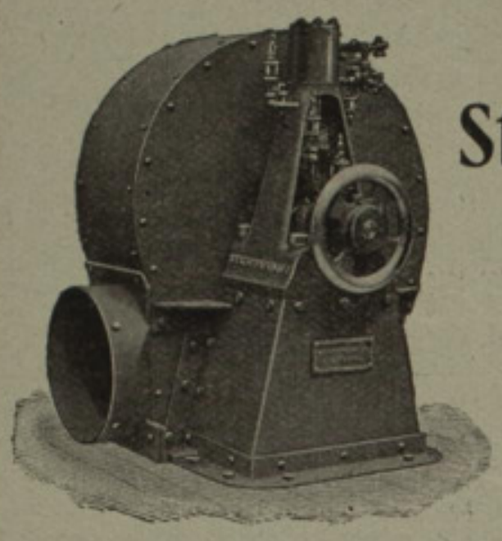

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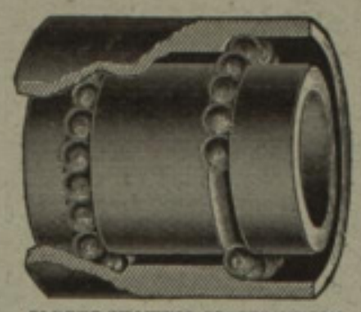

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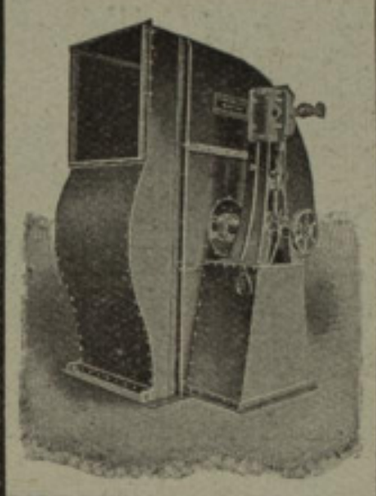

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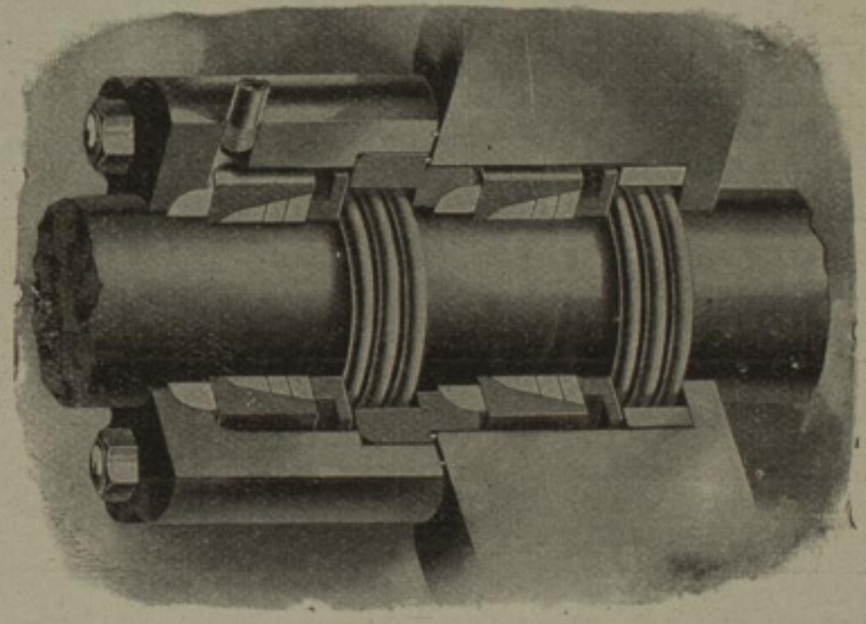

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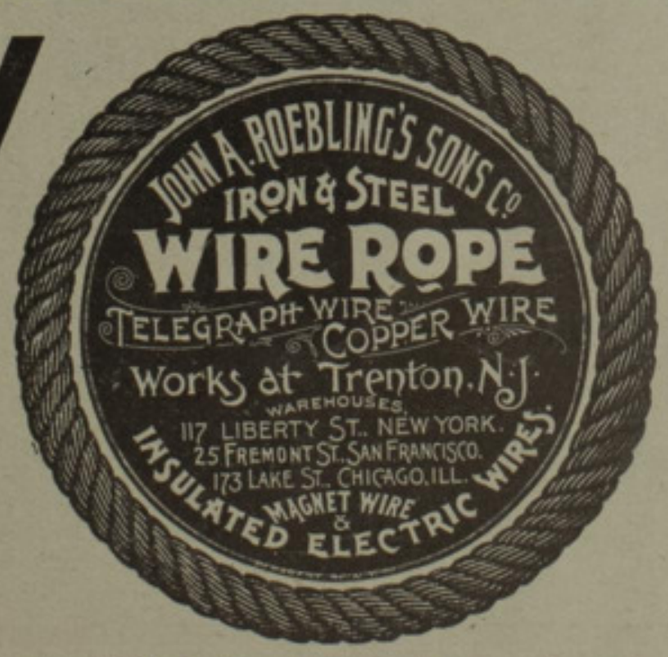

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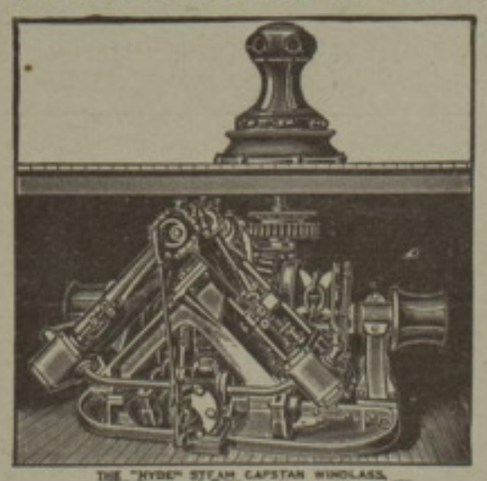

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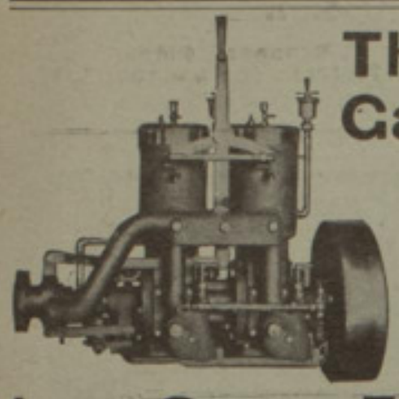

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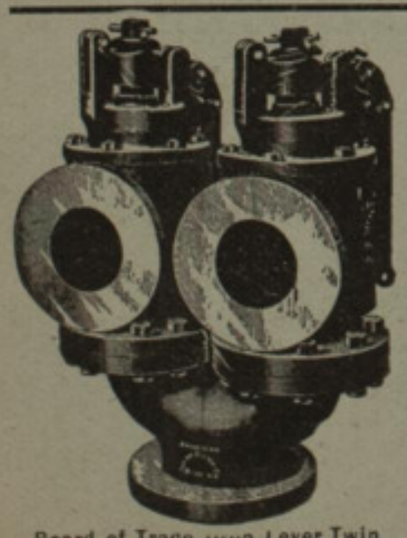

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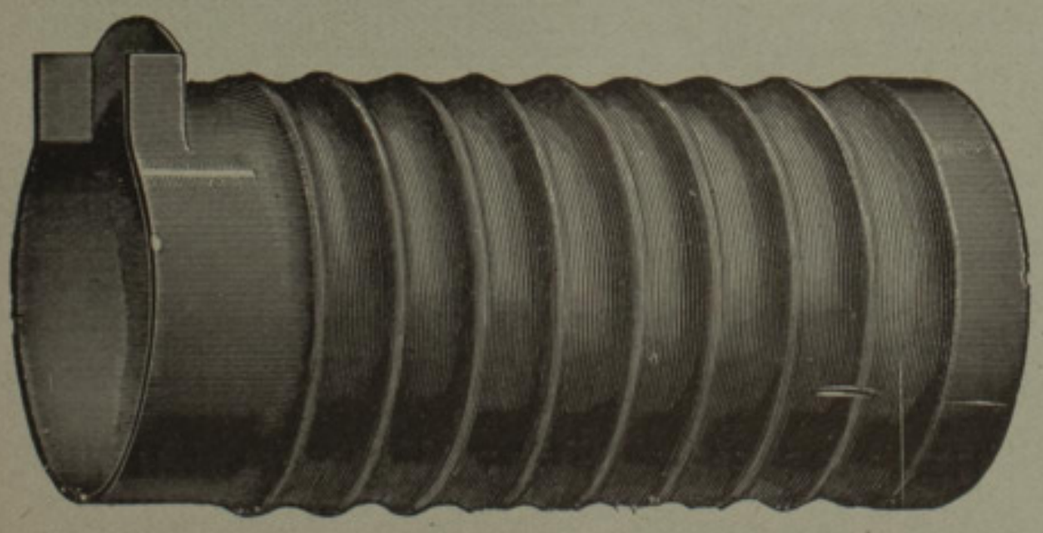

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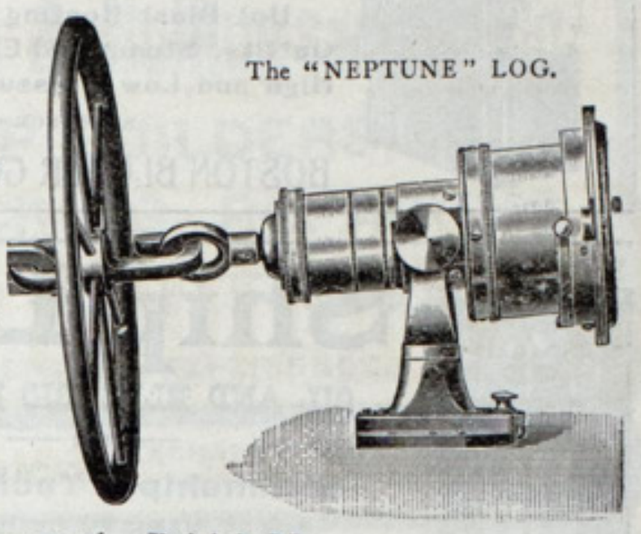

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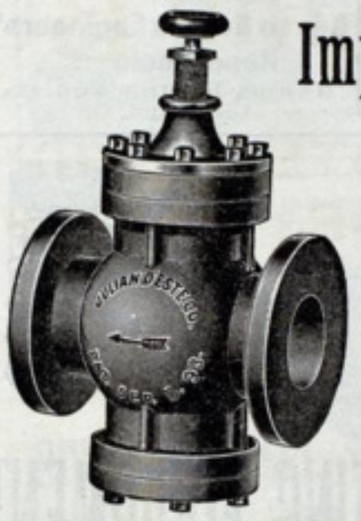

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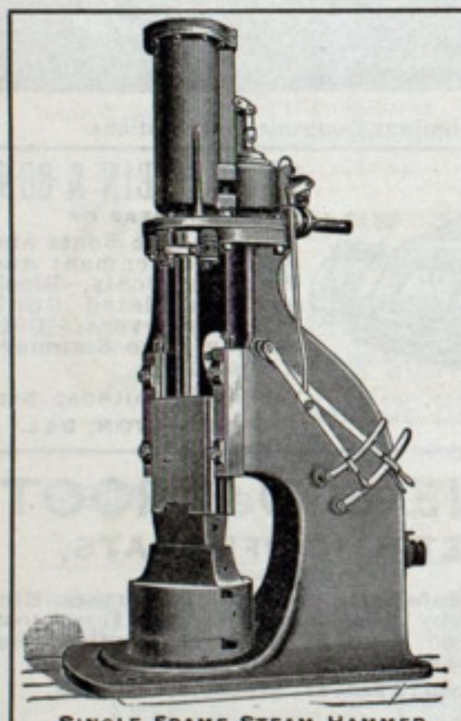

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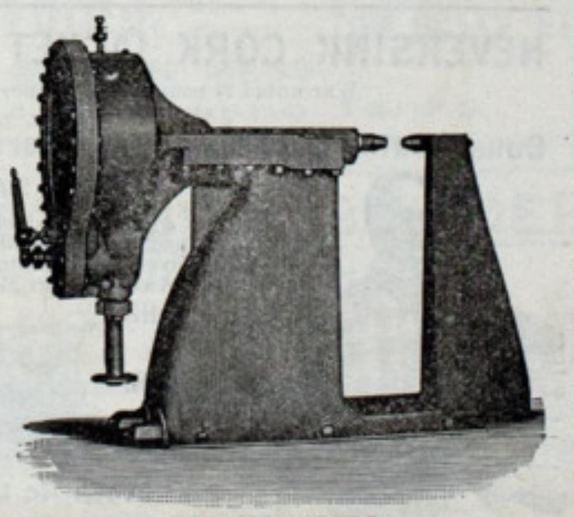

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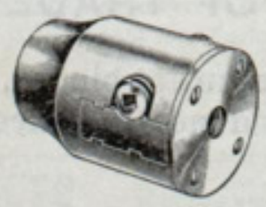

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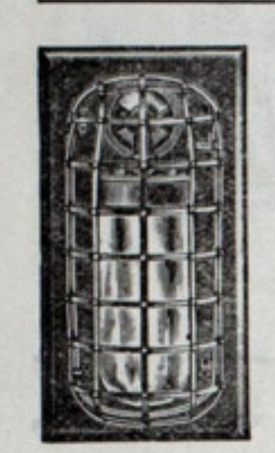

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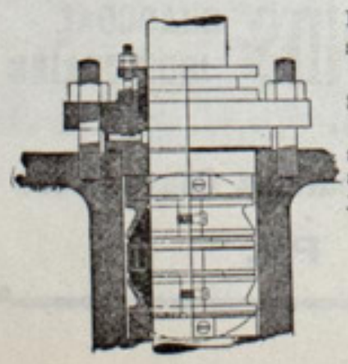

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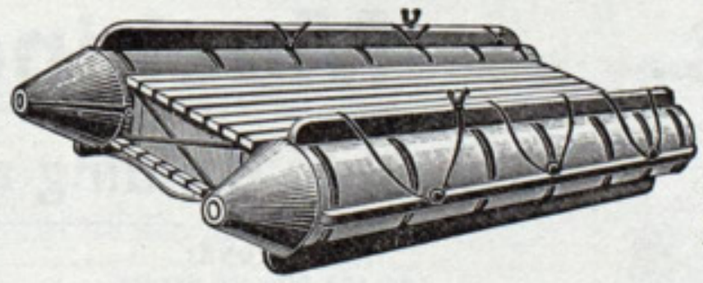

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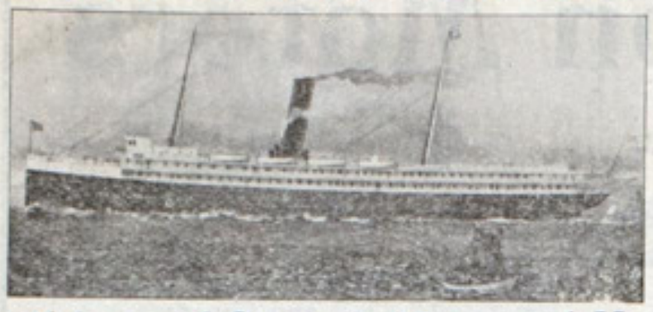

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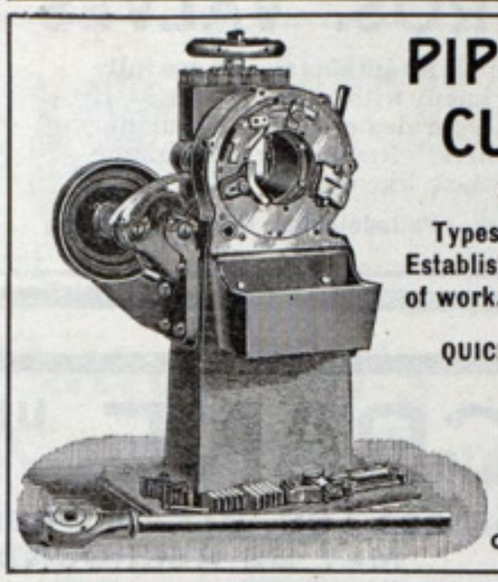

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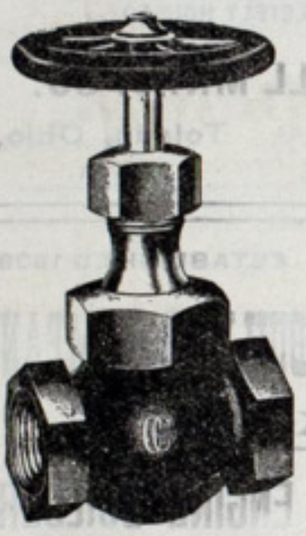

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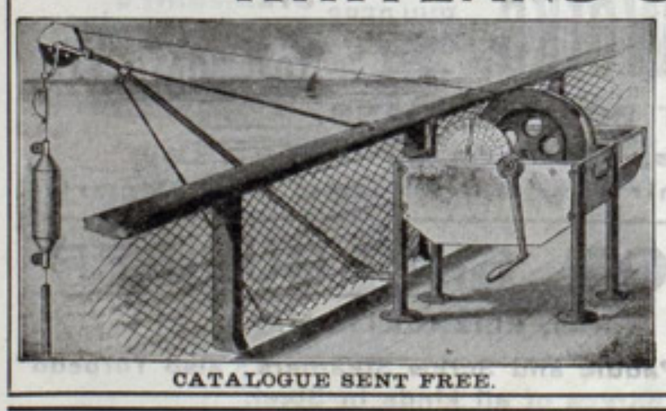

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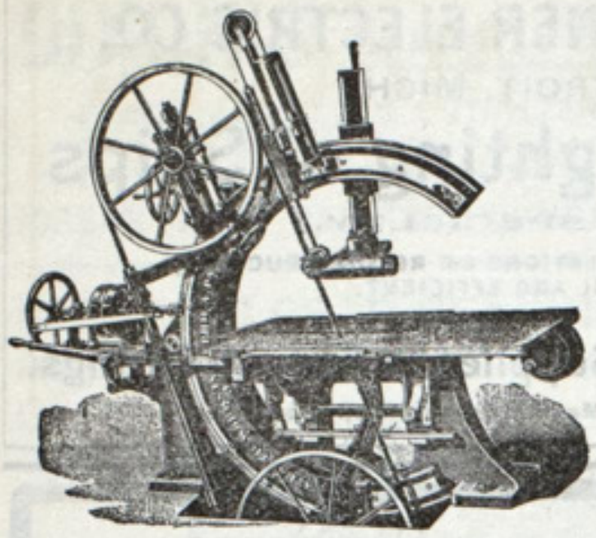

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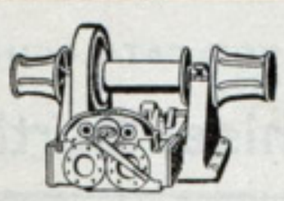

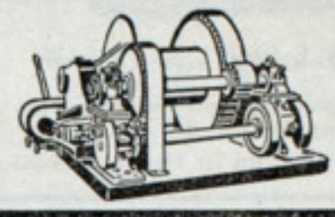

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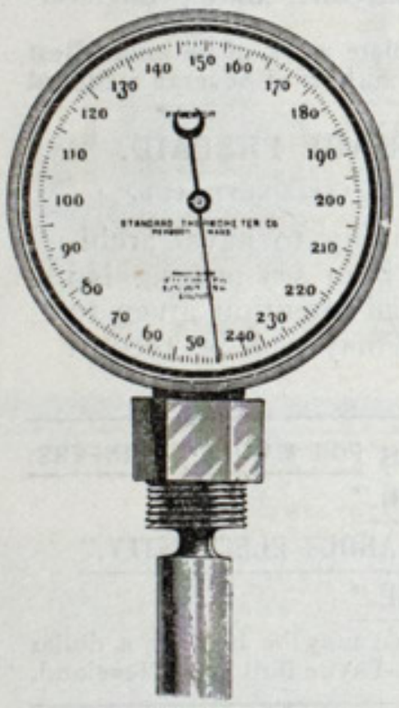

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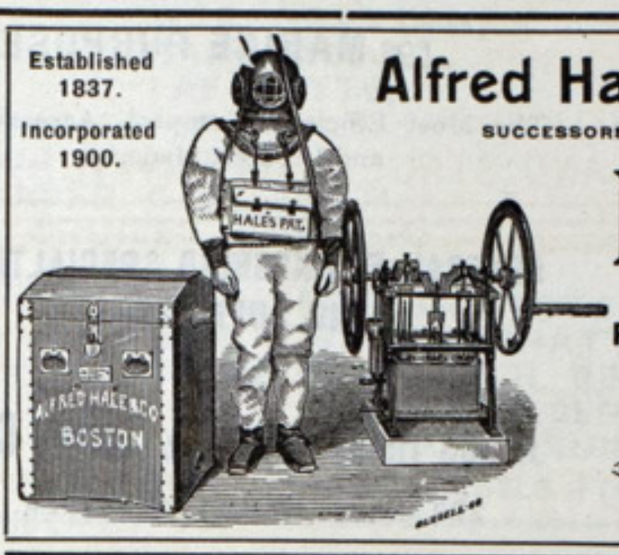

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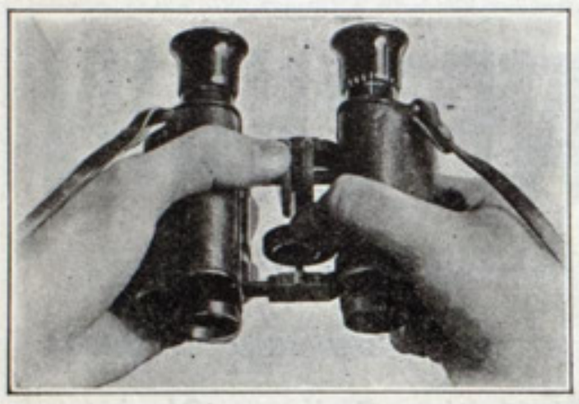

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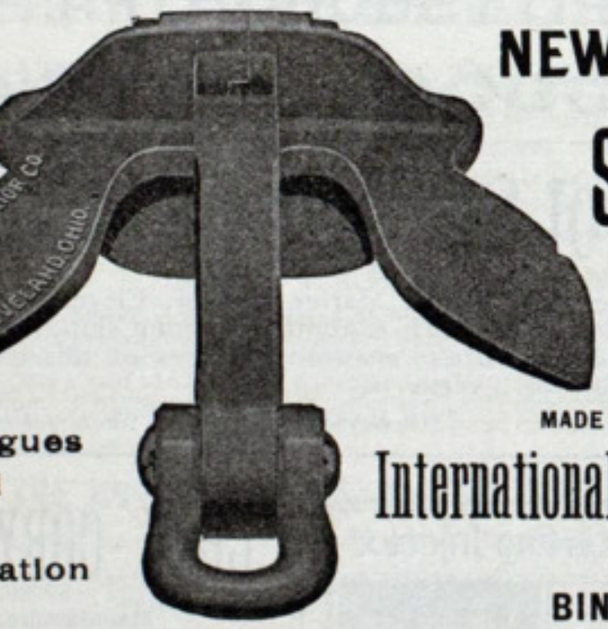

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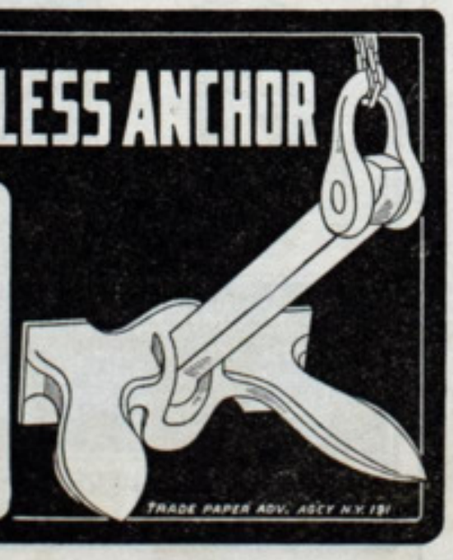

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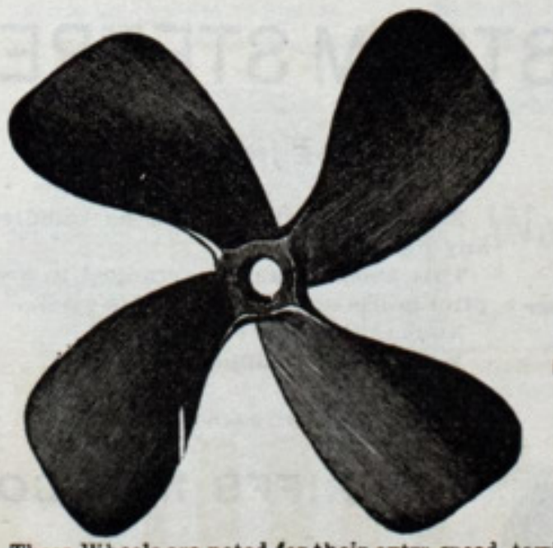

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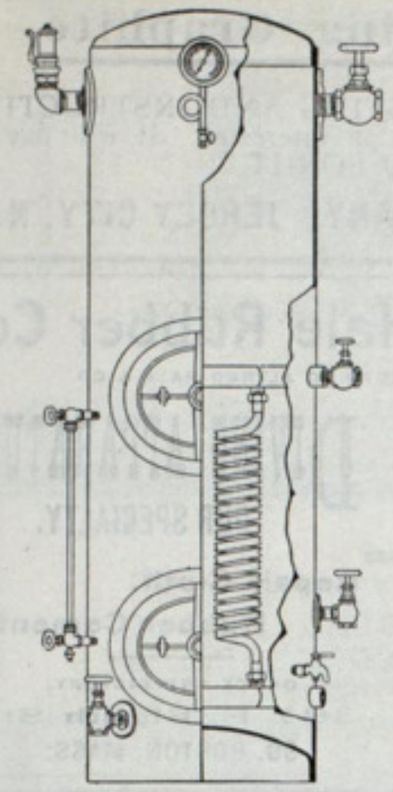

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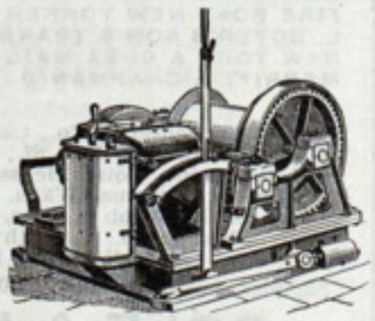

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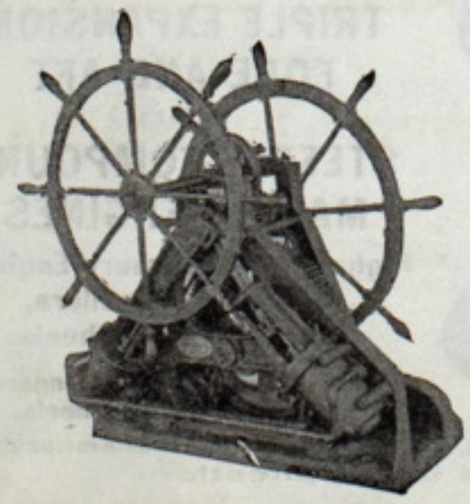

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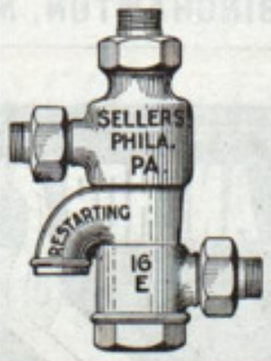

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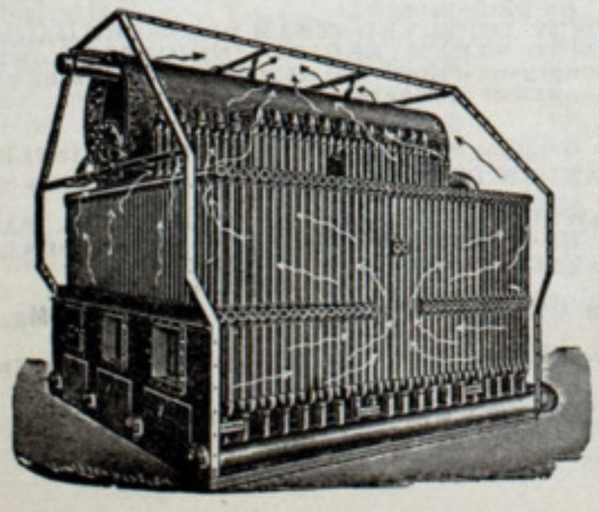

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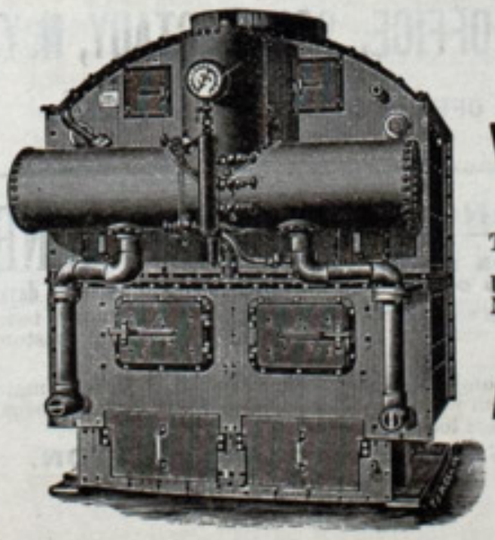

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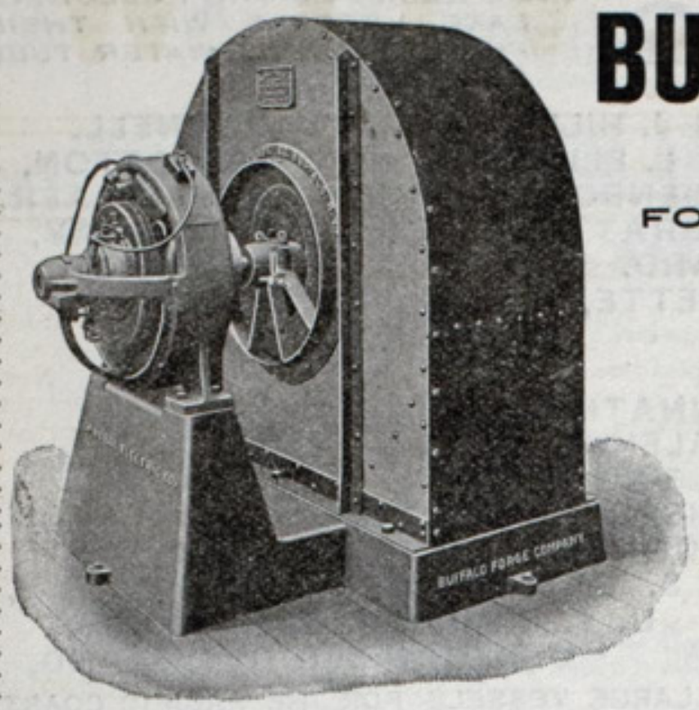

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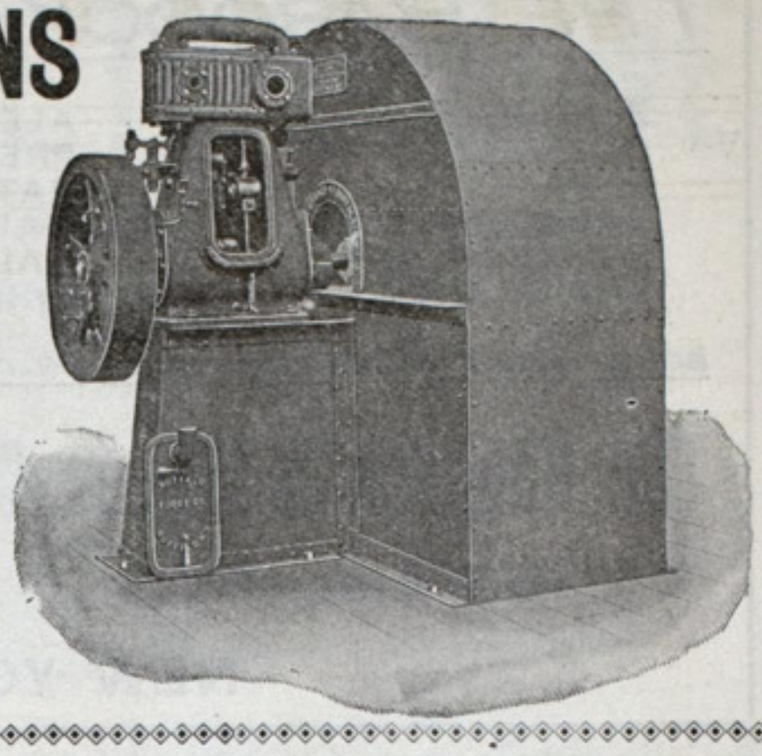

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